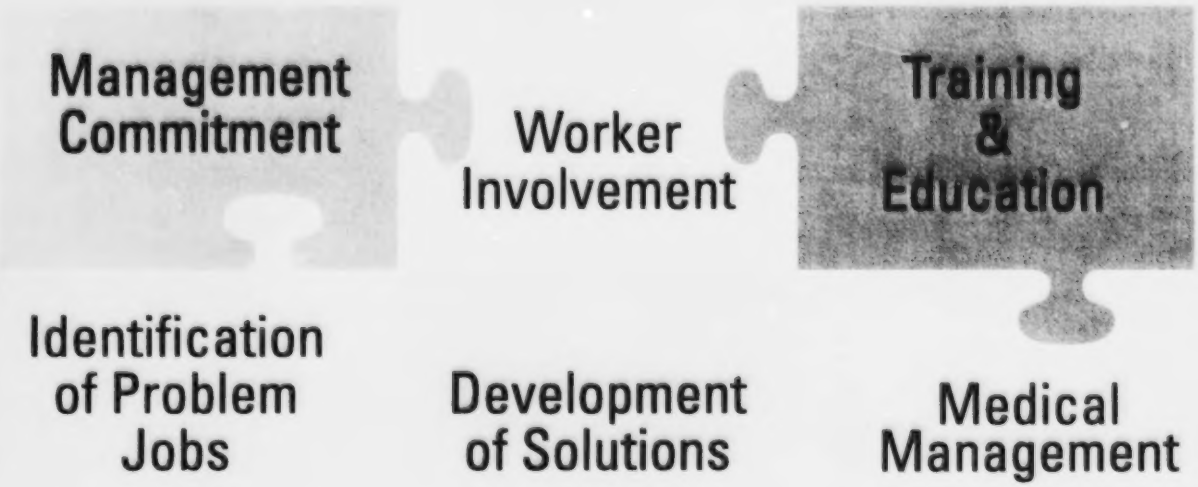
Ergonomics

A Guide to Program Development and Implementation



Version 1.0 November 1999

Manitoba
Labour
Workplace Safety
and Health Branch

100-04843/

Manitoba Labour – Workplace Safety and Health Branch

Ergonomics

A Guide to Program Development and Implementation

Fall 1999

This document is Version 1.0 of the Ergonomics Guideline. Updates will be provided, as new and relevant information becomes available. These updates can be found on our website (see below). If you have any questions or comments, please contact the Workplace Safety and Health Branch:

Phone: 945-3446 (Winnipeg)
1-800-282-8069

Website: www.gov.mb.ca/labour/safety

TABLE OF CONTENTS

1.0 INTRODUCTION 1-1

1.1 HOW TO USE THIS GUIDELINE 1-3
1.2 INTRODUCTION TO THE PROGRAM ELEMENTS 1-3
1.2.1 Management Commitment 1-4
1.2.2 Worker Involvement 1-4
1.2.3 Training and Education 1-4
1.2.4 Identification of Problem Jobs 1-4
1.2.5 Development of Solutions 1-4
1.2.6 Medical Management 1-4
1.3 RESPONSIBILITIES 1-5

2.0 MANAGEMENT COMMITMENT 2-1

2.1 BENEFITS OF AN ERGONOMICS PROGRAM 2-1
2.1.1 Reduction of Incidence of Musculoskeletal Injuries 2-1
2.1.2 Increased Productivity through Optimization of Work 2-1
2.1.3 Maintain or Improve Quality 2-1
2.1.4 Reduction of Absenteeism and Turn-over 2-2
2.2 RUNNING THE PROGRAM 2-2

3.0 WORKER INVOLVEMENT 3-1

3.1 WHERE AND WHEN WORKER INVOLVEMENT SHOULD OCCUR 3-2
3.2 TIPS FOR A SUCCESSFUL WORKER INVOLVEMENT PROGRAM 3-2

4.0 TRAINING AND EDUCATION 4-1

4.1 NEEDS ASSESSMENT 4-1
4.1.1 Ergonomics Program 4-2
4.1.2 Introduction to Ergonomics 4-3
4.1.3 Ergonomic Analysis 4-4
4.1.4 Task Specific Training 4-4
4.1.5 Training for Specialized Groups 4-5
4.1.6 Work Related Musculoskeletal Disorder Awareness 4-5
4.2 TRAINING DEVELOPMENT AND IMPLEMENTATION 4-6
4.3 TRAINING EVALUATION 4-6

5.0 IDENTIFICATION OF PROBLEM JOBS 5-1

5.1 HAZARD IDENTIFICATION 5-1
5.1.1 Recent Injury 5-2
5.1.2 New or Modified Process 5-2
5.1.3 Continuous Improvement 5-2
5.1.4 Worker Consultation 5-6
5.1.5 Direct Observation 5-6
5.1.6 Prioritizing Jobs for Assessment 5-9
5.2 HAZARD ASSESSMENT 5-11
5.2.1 Evaluation of Exposure to Risk Factors 5-12
5.2.2 Rating of Ergonomic Hazards 5-15
5.2.3 Identify Risk Factor Causes 5-17
5.2.4 Prioritize Jobs for Intervention 5-19

6.0 DEVELOPMENT OF SOLUTIONS 6-1

6.1 DETERMINE SOLUTION OPTIONS 6-2
6.1.1 Examining Original Design Specifications 6-2
6.1.2 Brainstorming 6-2
6.1.3 Analyzing Similar Operations 6-2

6.1.4 Consulting a Specialist 6-2
6.1.5 Reading Equipment Catalogues 6-3
6.1.6 Talking With Vendors 6-3
6.1.7 Talking With Trade Associations or Labour Unions 6-3
6.2 CHOOSE TYPE OF SOLUTION 6-3
6.2.1 Engineering Controls 6-3
6.2.2 Work Practice Controls 6-4
6.2.3 Personal Protective Equipment 6-5
6.3 EVALUATE SOLUTION OPTIONS 6-6
6.3.1 Effectiveness 6-7
6.3.2 Timeliness 6-8
6.3.3 Worker Acceptance 6-8
6.4 IMPLEMENT APPROPRIATE SOLUTION(S) 6-8
6.5 FOLLOW-UP 6-9

7.0 MEDICAL MANAGEMENT 7-1

7.1 PHASE ONE - INJURY PREVENTION 7-3
7.1.1 Job Descriptions (Physical Demand Descriptions) 7-3
7.1.2 Injury and Symptom Survey 7-3
7.1.3 Job Improvement Suggestions 7-4
7.1.4 Gradual Introduction to Work 7-4
7.2 PHASE TWO - INJURY MANAGEMENT/EARLY INTERVENTION 7-4
7.2.1 Injury Management – Documenting and Tracking of WMSDs 7-5
7.2.2 Seeking Appropriate Treatment 7-5
7.2.3 Questions for Injured Workers to Ask their Health-Care Providers 7-5
7.2.4 Modified Duty and Job Modifications 7-6
7.2.5 Challenges to a Successful Return to Work Program 7-7
7.3 PHASE THREE - CHRONIC INJURY 7-8

8.0 CONTACTS AND REFERENCES 8-1

8.1 CONTACTS 8-1
8.2 REFERENCES 8-3
8.3 INTERNET 8-5
8.4 GLOSSARY OF TERMS 8-6

APPENDIX A: SYMPTOMS SURVEY

APPENDIX B: ERGONOMIC ANALYSIS WORKSHEET

APPENDIX C: PHYSICAL DEMANDS DESCRIPTION

APPENDIX D: ERGONOMIC RISK FACTOR CHECKLIST

APPENDIX E: ERGONOMIC RISK FACTOR DEFINITIONS

APPENDIX F: WORKPLACE CAPABILITIES FORM

APPENDIX G: ENGINEERING CONTROL OPTIONS

APPENDIX H: GENERAL ERGONOMIC INFORMATION

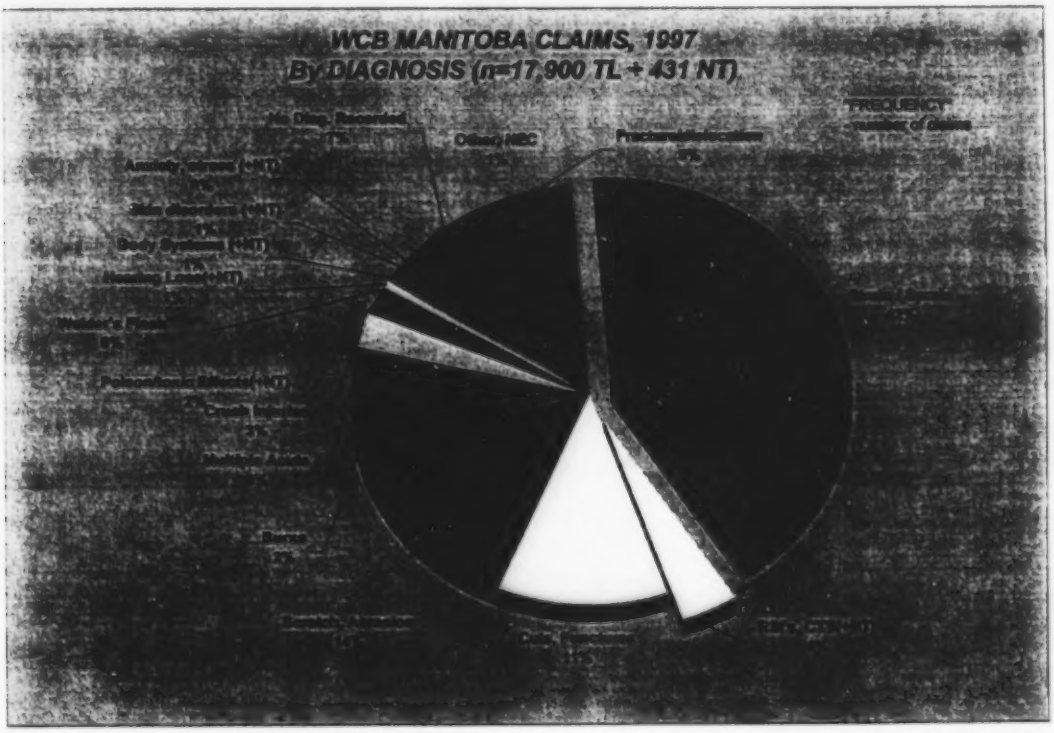
The Development of an Ergonomics Program

1.0 INTRODUCTION

The purpose of this guideline is to provide practical guidance in the prevention of work related musculoskeletal disorders (WMSDs). These WMSDs are often called cumulative trauma disorders (CTDs), repetitive strain injuries (RSIs), repetitive motion injuries, and many other descriptive names.

This guideline contains the basic information required to set up an ergonomics program. The following sections describe each element of the program, how the elements work together, and why each is important. If you are interested in more in-depth information, we have included an appendix of technical information, a glossary of terms, and a list of reference materials.

In 1997 more than half of Manitoba's Workers' Compensation Board claims were attributable to work-related musculoskeletal disorders such as sprains, strains, nerve compression, and joint inflammation. This guideline describes an ergonomics program that can help prevent or reduce these kinds of injuries to workers, and how to manage injuries if they occur.



Workplaces that have implemented ergonomics programs report significant decreases in accidents, injuries, illnesses and health-care costs over time. In the long run, this program can help increase worker comfort and safety, decrease workplace injuries and workers' compensation claims, save money, and in some cases increase productivity.

Table 1.1: Examples of Ergonomic Intervention in Manitoba Workplaces

Company	Issue	Intervention	Outcome
Window Manufacturing	- increasing musculoskeletal injuries - rise in WCB costs	- ergonomic training - ergonomic demonstration projects	- 19% decrease in time loss injuries - 49.84% reduction in WCB costs - 493 day reduction in time lost to injuries - 6.9 day decrease in the average days lost per WCB claim
Plastics Manufacturing	- back/shoulder RSIs - increase in WCB costs	- ergonomic training - redesign of high risk machines - installation of new machinery	- $69,306 decrease in WCB premium In single department (1994-98): - 95% decrease in RSIs - 100% decrease in lost hours - 20.4% increase in productivity - 19.9% increase in efficiency - 3.4% decrease in absenteeism - overall increase in worker morale
Nursing Home	- high numbers of musculoskeletal injuries, - high WCB costs	- ergonomic training, - change in work practices to reduce manual materials handling - new lift equipment	- $27,073.97 drop in WCB claims costs - 44.8% decrease in RSIs - total days lost decreased by 505 days, - decrease in WCB days lost by 43.3 days - decrease in average days lost per WCB claim by 16.9 days.

1.1 HOW TO USE THIS GUIDELINE

This guideline has been designed to be your manual for running an ergonomics program. To properly use this manual you must take the following steps:

1. Read the guideline and become familiar with all the elements.
2. Determine what resources are available to run the program (people, time, money, etc.).
3. Evaluate the present situation. Are workers getting injured? Is there the potential for ergonomic injuries?
4. Decide what to do to deal with the ergonomic concerns.

If you have any questions about this guideline, or if you would like assistance in getting an ergonomics program started, please contact:

Manitoba Labour
Workplace Safety and Health Branch
200-401 York Avenue, Winnipeg, MB, R3C 0P8
Client Service Desk: (204) 945-6848
Toll Free (in Manitoba only): 1-800-282-8069
Website: www.gov.mb.ca/labour/safety

1.2 INTRODUCTION TO THE PROGRAM ELEMENTS

This guideline presents six key elements of an ergonomics program. You may already be using some of these elements within your safety program; the basic concepts can be applied to safety, ergonomics, and even production.

If you want to produce a product and be successful, what do you do? You make a commitment to produce a reliable, high-quality product, and you will back up this promise with excellent customer service. You will let the workers and your clients know that this is your mission. You would then make sure that the workforce has the level of training required to achieve this mission. If there were any problems in meeting the goals, you would have a way of evaluating the problem (quality assurance, call-backs to clients, etc.). If any problems develop, you would have procedures in place to deal with them. If equipment breaks down, you would have maintenance personnel fix it.

This ergonomics program follows the exact same process. The most important asset in a company is the worker. This ergonomics program is designed to help make sure workers won't break down, but if they do you will have a way to figure out why injuries occurred, how you can stop them from happening again, and how you can help workers get better and return to work. If you are successful in running this program, you will be successful in reaching the company's mission.

Below is a brief introduction to the key elements of a successful ergonomics program:

1.2.1 Management Commitment

Occupational safety and health literature stresses that management commitment is key to the success of any safety and health effort. Management commitment demonstrates the employer's belief that ergonomic efforts are essential to a safe and healthy work environment for all workers. The success of a program must begin from the top. If management places a high priority on the safety and health of the workers, then all levels of management and supervision are assigned the task of addressing this priority.

1.2.2 Worker Involvement

Involving workers, both individually and through the joint Safety & Health Committee, in efforts to improve workplace conditions provides a number of benefits, including enhanced worker motivation and job satisfaction, improved problem-solving capabilities, and increased likelihood that workers will accept changes in the job or work methods.

1.2.3 Training and Education

Identifying and controlling WMSDs requires some level of knowledge of ergonomics and skills in developing solutions. Recognizing and filling different training needs is an important step in building an effective program.

1.2.4 Identification of Problem Jobs

A necessary component of any ergonomics program is the gathering of information to determine the scope and characteristics of the hazard that is contributing to the injury. *Identification of Problem Jobs* involves an analysis of the workplace that identifies jobs and workstations that may contain ergonomic hazards, the risk factors that pose the hazards, and the causes of the risk factors.

1.2.5 Development of Solutions

Once ergonomic hazards have been identified, the next step is to develop controls to eliminate or reduce these hazards by changing the jobs, workstations, tools or environment to fit the worker.

1.2.6 Medical Management

A workplace-based medical management program is an important part of the employer's overall effort to reduce the impact of work-related injuries. Medical management is effective use of available health-care resources to prevent or manage work-related musculoskeletal disorders.

1.3 RESPONSIBILITIES

Who is responsible for safety and health at the workplace? The employer? The workers? The government? All of the above?

Under the Workplace Safety and Health Act, the employer bears the primary responsibility for the safety, health and welfare of all workers at the workplace. This responsibility includes taking steps to:

- Reduce and eliminate hazards;
- Educate workers about hazards and safe work procedures; and,
- Develop and promote protective measures.

These general duties of an employer are detailed in section 4(1) of the Workplace Safety & Health Act:

> 4(1) Every employer shall in accordance with the objects and purposes of this Act:
>
> (a) ensure, so far as is reasonably practicable, the safety, health & welfare at work of all his workers;

The Workplace Safety and Health Act also details the general duties of the workers:

> 5(1) Every worker while at work shall, in accordance with the objects and purposes of this Act,
>
> (a) take reasonable care to protect his safety & health and the safety & health of other persons who may be affected by his acts or omissions at work;
>
> (b) at all times, when the nature of his work requires, use all devices and wear all articles of clothing and personal protective equipment designated and provided for his protection by his employer, or required to be used and worn by him by the regulations;

The information presented in this document provides guidance to both employers and workers on how they can deal with ergonomic issues and ensure that they are meeting the requirements of the Act with respect to ergonomics.

2.0 MANAGEMENT COMMITMENT

Commitment and involvement are complementary and essential elements of a sound safety and health program. Commitment by management provides the organizational resources and motivating force necessary to deal effectively with ergonomic hazards.

2.1 BENEFITS OF AN ERGONOMICS PROGRAM

The implementation of an ergonomics program can have many positive impacts on a company:

2.1.1 Reduction of Incidence of Musculoskeletal Injuries

Designing jobs so that they limit the ergonomic hazards that workers are exposed results in a decrease in the incidence of WMSDs. As illustrated in the pie chart on page 1-1, WMSDs account for 46% of all lost-time injuries with this number being significantly higher in some industrial sectors. A decrease in the number of WMSDs can have a positive effect in many ways:

- Skilled workers are not getting injured
- Costs of injury compensation are reduced
- Morale of workers is positive due to good working conditions

2.1.2 Increased Productivity through Optimization of Work

When developing solutions for an ergonomics issue, an integral part of the process is to maintain or improve production. The goal is to optimize the work process, which involves determining the best way to reach work goals while minimizing the chance of anyone getting injured. If you optimize a process, then the workers should be able to work steadily throughout the day, maintaining their level of work because they are not feeling fatigued or in pain.

2.1.3 Maintain or Improve Quality

In order to achieve a good and consistent level of quality, the process used for production must be well designed and controlled. If a machine is performing a process, then it is important to make sure that all its components are running smoothly, a schedule of regular maintenance is set, and checks for errors in output are performed on a regular basis. In the case of people, the quality of their work is based on their skills, experience, and their physical ability to perform the necessary tasks. If a job is designed with ergonomics in mind, then this will reduce the chance of workers getting injured; this will help ensure that the workers with the greatest skill and experience are able to continue working. If workers are able to maintain a similar level of effort (e.g. force required to insert a part; concentration required to perform a task) throughout the day, then they will be able achieve a consistent level of quality.

2.1.4 Reduction of Absenteeism and Turn-over

The full extent of a problem is not always seen in the number of workers who are being injured. Sometimes, workers will take a day off work because they are hurt and do not want to report it, or they just need to take a break. Sometimes, workers will just leave a job because they cannot see the benefit of being paid for a job that is causing them pain. If you design a task so that people do not work in pain, you will increase the likelihood that they will show up tomorrow and the day after that.

2.2 RUNNING THE PROGRAM

The implementation of an effective ergonomics program includes a commitment by the employer to provide the visible involvement of top management, so that all workers fully understand that the company is seriously committed to the program. An effective program should have a team approach, with top management as the team leader, and should include the following:

1. Management's involvement demonstrated through personal concern for worker safety and health as shown by the priority placed on eliminating ergonomic hazards.

2. A policy that places safety and health on the same level of importance as production. The responsible implementation of this policy requires management to integrate production processes and safety and health protection to ensure that this protection is part of the daily production activity within each facility.

3. Employer commitment to assign and communicate the responsibility for the various aspects of the ergonomics program, so that all managers, supervisors, and workers involved know what is expected of them.

4. Employer commitment to provide adequate authority and resources to all responsible parties, so that assigned responsibilities can be met.

5. Employer commitment to ensure that each manager, supervisor, and worker responsible for the ergonomics program in the workplace is accountable for carrying out those responsibilities.

A written program can be an effective way of organizing a program, but the key to an effective program is a tangible illustration of commitment by management. This can include such things as: assigning staff to ergonomics programs; providing training on ergonomic issues; implementing changes to reduce ergonomic hazards; and, incorporating ergonomics into accountability measures (i.e. ensure that individuals within the company take note of, and responsibility for, ergonomic injuries).

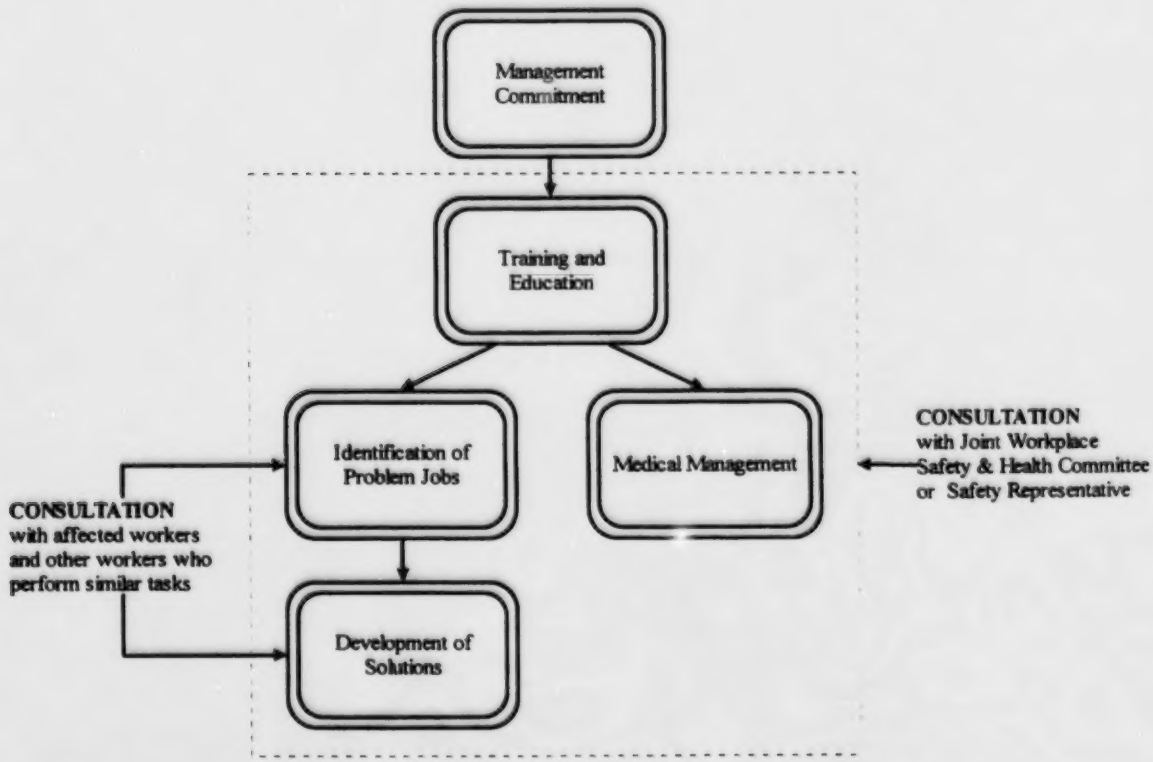
The first step in committing to this program is to read this guideline. When you know what the program entails, you can determine how and which resources can be allocated to implement the remaining elements. It will be necessary to develop a reasonable and practicable strategy for implementation that takes into account the financial and human resources available within the company.

3.0 WORKER INVOLVEMENT

The most effective and efficient application of ergonomics within a plant is through a participatory approach. The utilization of all persons involved in the work process will ensure that all necessary information, insight and points of view are available. The team involved in the ergonomics process may include some or all of the following individuals:

- Managers/supervisors
- Workplace Safety and Health Committee members
- Worker/union representative
- Maintenance or facilities staff
- Safety and health personnel
- Purchasing personnel
- Engineers
- Ergonomist

Worker involvement occurs at all levels of the ergonomic program. The flow chart below illustrates how the Joint Safety & Health Committee, Worker Representatives, as well as workers from the plant floor, are involved in the ergonomic program. The details of worker involvement throughout the ergonomic program are provided within the sections of each of the remaining elements.


Management Commitment
Training and Education
Identification of Problem Jobs
Medical Management
Development of Solutions
CONSULTATION with affected workers and other workers who perform similar tasks
CONSULTATION with Joint Workplace Safety & Health Committee or Safety Representative

3.1 WHERE AND WHEN WORKER INVOLVEMENT SHOULD OCCUR

- when the employer is identifying the areas of risk to establish priorities for assessment;
- during the risk assessment process;
- when determining which risk control strategies (including training) should be applied to prevent or reduce the risk of injury;
- when reviewing the effectiveness of implemented control measures; and,
- during the design and implementation/purchase of new workplace layout, furniture, work processes and equipment.

3.2 TIPS FOR A SUCCESSFUL WORKER INVOLVEMENT PROGRAM

If worker involvement is to be a successful, beneficial part of an ergonomic program, the following items should be addressed:

- **Management Commitment and Responsiveness**
  - Person(s) with authority must be involved in the program;
  - The group must be empowered to effectively perform certain tasks;
  - Recommendations from the team must receive timely responses;
  - Resources must be available to implement solutions;
  - Value of activities must be recognized and rewarded.

- **Training**
  - Co-ordinator of program and ergonomics team must have experience or receive training in group communication and interaction;
  - Specialized training must be provided for the workers to handle new activities.

- **Composition**
  - Individuals involved in the ergonomics program must have the skills necessary to perform their assigned duties, either through experience or training;
  - The skills and knowledge available within the company should be effectively utilized;
  - The size of the team should be appropriate to maintain an efficient, effective program.

- **Information Sharing**
  - For proper problem solving, the ergonomic team will need access to relevant information;
  - Certain information within a company's file, an employee's personnel file, and an employee's medical file is confidential. Information relevant to the ergonomics program should be compiled by those individuals with appropriate access to ensure confidentiality.

- **Activities/Motivation**

  To have a better chance of developing effective solutions, a team should have:
  - Leaders who are committed to group problem solving;
  - Deliberate discussions of ideas;
  - Orderly forms of data collection;
  - Use of analytical techniques.

4.0 TRAINING AND EDUCATION

In order to effectively identify and control work-related musculoskeletal disorders, some level of ergonomic awareness and knowledge training is required. It is an important means of reducing injury rates and in making changes to workplace conditions. Training can also be the means to communicate the ergonomics program, teach ergonomic principles and reinforce positive safe work behaviours. Recognizing and fulfilling different educational needs is an important step in building an effective ergonomics program. The training and education of various groups include:

Workers who need to be aware of the potential health risks related to their jobs, to know how to use ergonomic principles to work safely, and to understand their role in the ergonomics program.

Management who need to be aware of the ergonomic issues, how these affect the company, and the necessity of assigning resources to develop the ergonomics program.

Supervisors who need to be aware of WMSDs, their effects on workers, the importance of ergonomics in designing optimal jobs to prevent problems, and the facilitation of worker involvement in the identification and solution process.

Facility operations personnel who need to understand ergonomics when designing or changing workstations or purchasing new equipment.

Safety and Health Committee members and or Ergonomics Analysis teams must know how to identify problem jobs, quantify ergonomic risk factors and evaluate proposed changes to jobs.

Ergonomic program facilitator / group who must be familiar with the entire ergonomics program. Involved in co-ordination of program activities.

4.1 NEEDS ASSESSMENT

The first step in developing a training and education program is to match your company's training needs with those presented in Table 4.1. Each training program can be developed for specific groups or for general training across a wide range of worker groups. Companies who have had positive ergonomic results have incorporated these training programs into their overall ergonomics program. In order to produce these positive results, training must be accepted as having merit and value by all levels of the organization, and training must be developed and implemented in a systematic, yet flexible, manner. Failure to properly plan and develop training programs may diminish results and waste valuable resources.

Table 4.1: TRAINING NEEDS

WORKER GROUPS	ERGONOMIC TRAINING PROGRAMS					
	Ergonomics Program	Introduction to Ergonomics	Ergonomic Analysis	Task Specific Training	Training for Specialized Groups	WMSD Awareness
MANAGEMENT	✓ (tailored to top management)	✓				✓
WORKERS • All workers	✓ (specific roles)	✓				✓
• Workers requiring specific training in their jobs				✓		
SUPERVISORS	✓	✓		✓ (as required)		✓
FACILITY OPERATIONS PERSONNEL • Maintenance • Engineering • Purchasing	✓ (specific roles)	✓			✓	✓
ERGONOMICS TEAM/ SAFETY & HEALTH COMMITTEE	✓ (specific roles)	✓	✓		✓	✓
ERGONOMIC PROGRAM FACILITATOR/GROUP	✓	✓	✓	✓	✓	✓

4.1.1 Ergonomics Program

Objectives:

- To introduce and become familiar with the ergonomics program.
- To learn specific roles and responsibilities in the ergonomics program.
- Develop an initiative to take action.

Who:

- Top level management.
- Managers, supervisors, workers, facility operations personnel, and safety and health committee members.
- Ergonomic program facilitator / group.

When:

- Initially when setting up and implementing the ergonomics program.
- Periodically with changes in work organization and evaluation / feedback meetings.

Topics to be Covered:

- Ergonomics, WMSDs and the elements of an ergonomics program.
- The structure of an ergonomics program.
- Need and importance of commitment to preventing and controlling WMSDs.
- The management of an ergonomics program's policies, procedures and evaluation.
- All worker groups' roles and responsibilities in the ergonomics program.
- What to expect when an ergonomics initiative is undertaken.

4.1.2 Introduction to Ergonomics

Objectives:

- To develop an understanding of ergonomics, human capacities and limitations, and the benefits of proper job design.
- To develop skills to recognize opportunities for improvement and to initiate corrective action.

Who:

- Top level management.
- Managers, supervisors, workers, facility operations personnel, and safety and health committee members.
- Ergonomic program facilitator / group.

When:

- Once the ergonomic program's policies and procedures are developed.
- When new workers are hired.
- Refresher training.

Topics to be Covered:

- Ergonomics and work.
- Designing the task to fit the person.
- Human capabilities, limitations and how the body functions.
- Ergonomic risk factors.
- Applying ergonomic principles to make work easier and safer.

4.1.3 Ergonomic Analysis

Objective:

- To learn risk factor identification and problem solving skills.

Who:

- Members of the Safety and Health Committee and / or ergonomic analysis team and ergonomic program facilitator / group.

When:

- Early in the ergonomics program development and as refresher training.

Topics to be Covered:

- Training in surveying for problems, risk factor identification methods, assessment methods and interpretation skills.
- Promotion and utilization of safe work procedures, practices and techniques established for the prevention and control of WMSDs.

4.1.4 Task Specific Training

Objectives:

- To provide workers with relevant knowledge and skills to enable them to perform a task in a safe and healthy manner. Usually applied to a specific group of workers exposed to ergonomic risk factors, however all workers may receive task specific training.

Who:

- The ergonomics program facilitator / group.
- Workers in jobs where there are WMSDs, their supervisors and members of the Safety and Health Committee.

When:

- Initially to the ergonomics program facilitator / group.
- To workers when the ergonomics program is first set up in their jobs, when they are initially assigned to identified jobs with risk factors and when new control measures are implemented.
- When new processes, equipment or procedures are introduced into the workplace.
- Periodically as needed.

Topics to be Covered:

- Training on new equipment and methods where specific controls and work practices have been implemented. This may include new tools and equipment , specific techniques (lifting, hand use) or use of proper personal protective equipment.
- Training can also include skill improvement, stress management, and physical fitness.
- Training should be specific to the task and aim to ensure that the worker:
  - understands the reasons for doing the task with the least risk to health and safety;

- ➢ can recognize the health and safety risk within a task and decide on the most appropriate safe work practice;
- ➢ can perform and maintain the specified safe work practices and procedures.

- Task specific training should be supplemented by appropriate supervision and monitoring of the specified safe work practices and procedures.

4.1.5 Training for Specialized Groups

Objectives:
- Learn to effectively develop and implement measures to control WMSDs by applying ergonomic principles to new designs or redesigns of workstations, equipment, or plant layout.

Who:
- The ergonomics program facilitator / group.
- Workers responsible for the design, selection and maintenance of plant equipment, workstations and processes, (engineers, maintenance, purchasers).

When:
- Initially to the ergonomics program facilitator / group.
- When the ergonomics program is first developed.
- Before major changes are designed for the plant floor.

Topics to be Covered:
- Ergonomic principles for the prevention and correction of hazards through equipment (re)design, purchase or maintenance.
- How to apply ergonomic principles.
- General measures to prevent or minimize exposure to risk factors.
- Cost effectiveness of ergonomic methods and their value in the total job design process.
- Process for involving workers in participatory engineering design and review.
- Understanding the process for ergonomic design, including: defining users, understanding the interaction of users with their equipment and tools, defining problems with current equipment and tools, defining objectives and criteria for success, using available ergonomics standards and guidelines, conducting trials, training users and evaluation.

4.1.6 Work Related Musculoskeletal Disorder Awareness

Objectives:
- Identify the early signs and symptoms of WMSDs.
- Prevention of chronic injuries.

Who:
- All workers.

When:
- Once ergonomics program is developed.

Topics to be Covered:

- Ergonomic awareness training.
- Types of WMSDs.
- How to recognize WMSD signs and symptoms and the importance of early reporting.
- How to recognize WMSD risk factors and how to report them.
- Prevention and control measures.
- Specific roles and responsibilities of those involved in the ergonomics program.
- Methods and procedures for reporting concerns.

4.2 TRAINING DEVELOPMENT AND IMPLEMENTATION

Many training development and implementation factors must be taken into account if the training effort is to produce the desired results. Methods, activities, human and material resources, location, planning and scheduling must all be considered as the training program is developed. Other important considerations include:

- Worker involvement in the design of the training program. Using workers own work experiences can help illustrate principles to be learned. Using workers as instructors can also be used to motivate other learners and improve communication.

- Learning by doing. By applying "hands-on" methods of knowledge and skill acquisition, active participation can enhance learning.

- Apply technology to illustrate principles such as audiovisual equipment and computers. Much like active participation, technology provides opportunities for learners to "visualize" the course materials and to test their knowledge dynamically and immediately.

- Use of on-the-job training is preferred over classroom training. However, both can be effective in combination.

- The structure and content should be tailored to meet the specific needs and learning requirements of the target group, including the specific needs of workers of non-English speaking backgrounds.

4.3 TRAINING EVALUATION

For an ergonomics training program to be successful, periodic evaluation of the training is necessary. Evaluation can involve:

- Measuring the outcomes of training against the objectives.
  - Example 1: Does management develop a plan of action and provide resources for the ergonomics program?
  - Example 2: Are ergonomic checklists used and gathered before changes are made?

- Measuring feedback from the workers.
  - Example 1: How well do workers understand and retain their new knowledge.
  - Example 2: Is there a formal method for workers to provide feedback?

- Observing worker behaviour and measuring any changes?
  - Example 1: Do workers follow proper procedures and use ergonomic techniques?
  - Example 2: Are there short term measurable changes, such as those measured by worker surveys?

Training should be re-evaluated whenever new equipment, tools or techniques are introduced into the workplace. Each training session and those who participated should be tracked and developed into a simple matrix.

5.0 IDENTIFICATION OF PROBLEM JOBS

The next part of your ergonomics program should be Identification of Problem Jobs, which can be thought of as a safety and health worksite analysis that addresses work-related musculoskeletal disorders. A worksite analysis is a structured process for identifying jobs and workstations that may contain ergonomic hazards, the risk factors that pose the hazards, and the causes of the risk factors. A worksite analysis sets the stage for the rest of your program.

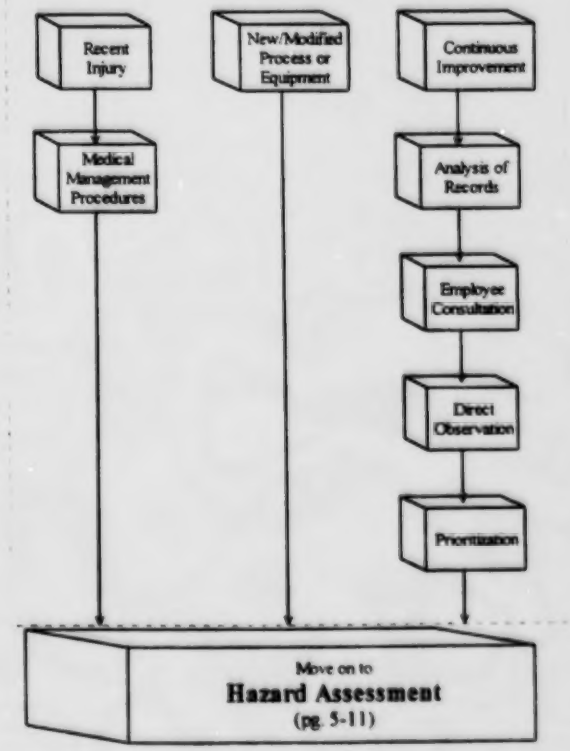
This element of the program should be carried out in a joint effort between management and the workers, Workplace Safety and Health committees, and/or worker representative(s). This co-operative process should occur during the two main steps in this element:

- Hazard Identification
- Hazard Assessment

5.1 HAZARD IDENTIFICATION

The Identification of Problem Jobs begins with the process of Hazard Identification. This process can be triggered by three workplace events: a recent injury; introduction of a new or modified process; or, the implementation of a continuous improvement program. The flow chart to the right illustrates the steps involved in response to each of these three events.

Hazard Identification



Recent Injury

A worker has reported a new injury. If the injury is a musculoskeletal injury, then an ergonomic hazard assessment should be included in your incident investigation.

New or Modified Process

If you change a process or add a new piece of equipment to a work area, then you should perform an ergonomic hazard assessment to ensure the safety and health of the workers.

Continuous Improvement

The reduction of injuries in the workplace is a continuous process. This section will guide you through the process of setting your goals for improvement.

5.1.1 Recent Injury

When a worker reports an injury, the following steps should be followed to determine the possible influence of ergonomic factors:

1. Follow Medical Management procedures (see section 7.0)
2. If the injury is a musculoskeletal injury (consult health care professional), then perform Hazard Assessment (Pg. 5-11)

5.1.2 New or Modified Process

If you change a procedure, or introduce a new tool or piece of equipment, then an ergonomic Hazard Assessment should be performed to ensure that you are not introducing any ergonomic problems within the workplace.

The procedures for a Hazard Assessment begin on page 5-11.

5.1.3 Continuous Improvement

In the case of continuous improvement, you are not reacting to events within the plant (injuries, purchases, line changes, etc.), but instead you are continually reviewing the safety and health performance of your plant to determine where improvements are needed.

The Hazard Identification process has four steps within a continuous improvement program:

5.1.3.1 Analysis of Records

Reviewing company records to identify patterns of injuries (or potential injuries) will help you find the jobs and workstations that may have ergonomic hazards.

Injury records can be used to:

- identify hazards;
- identify where and in what jobs WMSDs have occurred;
- determine nature of injury; descriptions of the incident could help determine how the injury occurred;
- determine the frequency and severity of injuries compared to numbers of workers, hours worked or areas of work; and,
- compare injury characteristics between different areas of the plant; higher frequency and/or severity rates indicate areas of greater priority for risk assessment and control.

When Should You Do a Records Review?

You will want to conduct a records review at least once a year to measure progress and to see if new problem areas have developed. You should also consider conducting a records review whenever:

- the product line changes or new products are added;
- the workplace moves to a different location;
- workstation configurations change;
- the company purchases new equipment; and,
- work methods or procedures change.

You should conduct a records review both before and after these kinds of workplace changes are made. This will give you a better idea of whether the changes have created new problems. Periodic reviews will help you keep your program focused and give you ways to measure success.

What Records Should You Review?

The records available for review will depend on the record-keeping requirements and needs of your company. (Smaller companies typically have fewer record-keeping requirements but should find that some of these records are available to them.) You should be aware that many of these records may contain confidential information. It is important that the ergonomics team maintains confidentiality. You may also need to remove workers' names and other identifying information from certain records to comply with the law.

Here are some of the records you may want to use when trying to determine where there are problems with work-related musculoskeletal disorders in your company:

- Workers' compensation claims*;
- First-aid room logs*;
- Accident reports or incident reports;
- Safety meeting reports or minutes (required of all employers);
- Safety and/or workplace audits;
- Worker complaints; and,
- Symptom surveys*.

*Note: May contain confidential information.

What Should You Be Looking For In the Records?

You should review available records for signs of potential work-related musculoskeletal disorders. Specifically, you should look for injuries or symptoms related to injury of parts of the musculoskeletal system[1].

[1] Musculoskeletal system: the soft tissues and bones of the body. The parts of the musculoskeletal system are bones, muscles, tendons, ligaments, cartilage, nerves, and blood vessels.

The following is a list of **Injuries** that may be caused by exposure to ergonomic hazards. There may be other injuries that show up in your records that are not in this list; you should consult with a health care professional for clarification.

- **Carpal tunnel syndrome**: A compression of the median nerve as it passes through the carpal tunnel in the heel of the hand.
- **Chronic low back pain**: General soreness and fatigue of the low back; pain is usually constant, and it accompanies most activities.
- **Cubital tunnel syndrome**: Compression of the ulnar nerve as it passes through the notch of the elbow.
- **Cumulative trauma disorder**: Damage to body tissue by outside forces that has built up over time.
- **DeQuervain's Disease**: An inflammation of the tendon and/or its sheath at the base of the thumb.
- **Digital neuritis**: Compression of the nerves along the sides of the fingers or thumbs.
- **Epicondylitis**: An inflammation of the tendons at the elbow. Also called tennis elbow (lateral or outside part of the elbow), or golfer's elbow (medial or inside part of the elbow).
- **Ganglionic cyst**: Swelling of the tendon and sheath due to the build-up of synovial fluid inside the sheath. The cyst usually causes a bump under the skin.
- **Non-specific backache**: General soreness and fatigue of the low back.
- **Raynaud's Phenomenon**: A constriction of the blood vessels in the hands and fingers. Also called "white finger."
- **Rotator cuff tendinitis**: Inflammation of one or more tendons at the shoulder. Also called "Pitcher's Shoulder."
- **Sprain**: Overstretching or overexertion of a ligament that results in a tear or rupture of the ligament.
- **Strain**: Overstretching or overexertion of a muscle or tendon.
- **Tendinitis**: Inflammation of the tendon inside the sheath.
- **Tenosynovitis**: Inflammation of the sheath around the tendon.
- **Thoracic outlet syndrome**: Compression of the nerves and blood vessels between the neck and shoulder often associated with prolonged overhead work.
- **Trigger finger**: A common term for tendinitis or tenosynovitis that causes painful locking of the finger(s) while flexing.
- **Ulnar nerve entrapment**: Compression of the ulnar nerve as it passes through the wrist, often associated with prolonged flexion and extension of the wrist and pressure on the palm.

A job may be considered to have ergonomic hazards if the following **Symptoms** show up in your record review:

- Painful joints;
- Pain in back, neck, wrists, shoulders, forearms, knees, etc;
- Pain, tingling or numbness in hands or feet;
- Fingers or toes turning white;

- Shooting or stabbing pains in arms or legs;
- Swelling or inflammation;
- Stiffness;
- Burning sensations;
- Weakness or clumsiness in hands; dropping things.

Record the types of musculoskeletal symptoms you find, along with information that will help lead you to the source of injuries and illnesses. Specifically, you need:

- Description of injury or illness, including affected body parts.
- Job title or position title of the worker.
- Previous job title and job description of the worker.
- Department where worker works.
- Job at time of injury or illness.
- Shift(s) at time of injury or illness.
- Time on the job or time spent doing that type of work.
- Date of injury or illness.
- Indication of any accident or injury prior to working at the job.
- Description of equipment used on that job.

Symptom Survey

If your injury records are not up to date, or if they are not very detailed, then an excellent way to get current information about your workers is with a symptom survey. The symptoms survey can be used to measure the extent of symptoms of WMSDs in each area of the work environment and to determine which jobs are leading to worker pain and/or discomfort. The survey could also be conducted to measure worker awareness of work-related disorders and to provide a method for workers to report the location, frequency and duration of discomfort. An example of a symptom survey is provided in Appendix A. All workers should complete the first 14 questions of the symptom survey. A detailed description of how to fill in these questions is provided in Appendix A along with the survey.

When evaluating the results of your symptom survey, a worker may be described as having a work-related musculoskeletal injury if the following criteria are satisfied:

Symptoms (pain, numbness, tingling, aching, stiffness, or burning) have occurred within the preceding year and the following applies:

1. The worker has had no previous accident or sudden injury that was not work-related; *AND*

2. Feeling of "Discomfort" is experienced "Always"; *OR*

3. Feeling of "Pain" is experienced "Often" or "Always"; *OR*

4. Feeling of "Severe Pain" is experienced "Occasionally", "Often", or "Always".

Hazard Identification Part I
If you find that your analysis of records indicates the presence of musculoskeletal injuries (see pg. 5-3 & 5-4), then you can say that there is an indication of an ergonomic hazard. If the results of a symptoms survey show the presence of WMSDs (see above), then you can say that there is an indication of an ergonomic hazard.

5.1.4 Worker Consultation

Consultation during the risk identification process with workers, worker representative(s), and/or the joint Safety & Health Committee may provide further information about associated risk factors.

It is important to consult with workers performing the task, as they will have the only day-to-day insight into how and what tasks are performed. Workers may be able to indicate tasks or movements which are particularly fatiguing, strenuous or difficult to perform.

You may wish to simply talk with or interview the workers, or you may want to distribute a questionnaire. The Ergonomic Analysis Worksheet (see *Direct Observation*) has space for recording your interview with the worker(s) who are performing the job(s).

Hazard Identification Part II
If you find that a worker mentions an injury or symptom such as those described in *Analysis of Records (pg. 5-3 & 5-4)*, then you can say that there is an indication of an ergonomic hazard. If you find that a worker mentions something about their job that is considered an ergonomic risk factor (see *Risk Factor Definitions, pg. 5-19 to 5-23*), then you can say that there is an indication of an ergonomic hazard.

5.1.5 Direct Observation

The next step in identifying problem jobs is to study the jobs to determine if there are any risk factors present. Your study of the jobs should be a team effort and should include input from the worker as well as observers from the ergonomics team. A team effort will help to confirm the presence of risk factors as well as ensure that as many factors are identified as possible.

It is important that team members are properly trained in the performance of a worksite investigation and in the use of the appropriate tools before an analysis begins. Three forms have been provided to help in the process of *Direct Observation*:

1. Ergonomic Analysis Worksheet (Appendix B)
2. Physical Demands Description (Appendix C)
3. Ergonomic Risk Factor Checklist (Appendix D)

5.1.5.1 Ergonomic Analysis Worksheet (EAW)

The EAW is a worksheet that can be used as the covering pages for both the physical demands description and the risk factor checklist. It is recommended that you use the

EAW with each analysis, as the information you record here could be crucial for your analysis and the development of solutions. The EAW provides space where you can record some of the general information about the job. The following sections can be filled out over the course of your *Hazard Identification* and *Hazard Assessment*:

Basics:	Date, analyst, job, department, shift.
Job Description:	A step-by-step account of how the job is performed.
Scheduling:	Time factors related to the performance of the job (e.g. cycles, shifts, breaks, etc.).
Tools/Materials:	A list of the tools or materials that are handled and their weights.
Worker Interview:	A space provided to record comments from the worker(s).
Diagram of Workstation:	A space for sketching out the work area, including measurements of work heights, etc.
Comments:	A space for recording any thoughts or comments that do not fit into the other areas.

5.1.5.2 Physical Demands Description (PDD)

A PDD is a description of the physical demands or activities that are required to perform the job. An example form, instructions on its use, and some key definitions are provided in Appendix C. If you have used the PDD in the development of the *Medical Management* (section 7.0) element of the program, then you can use the information you have already collected to determine if any ergonomic hazards are present.

Within the PDD a number of physical demands are considered to be Trigger Risk Factors. These factors give an indication that there is risk associated with performance of the job. Trigger Risk Factors include:

- All Strength factors
- All Posture factors
- Mobility factors
- Work Environment factors
  - ➢ Hot
  - ➢ Cold
  - ➢ Vibration
  - ➢ Contact Stress
- Work Conditions
  - ➢ Machine Paced
  - ➢ Production Quotas
  - ➢ Deadline Pressures
  - ➢ Irregular/Extended Hrs.

Hazard Identification Part IIIa
If you mark any of physical demands as a Trigger Risk Factor, then you can say that there is an indication of an ergonomic hazard.

5.1.5.3 Ergonomics Risk Factor Checklist (ERF)

If you are not planning on using a PDD within your *Medical Management* program, then the ERF checklist should be used to assess the jobs. The ERF checklist is a list of job factors that are known to increase the probability that a person will develop a musculoskeletal injury. This list provides a quick method to identify the most obvious risk factors. An example form is provided in Appendix D.

The ERF is a five-page checklist providing a list of risk factors that you will be looking for within each job. The risk factor list is divided into three sections:

1. Upper Extremity
2. Back and Lower Extremity
3. Manual Materials Handling

The following risk factors are evaluated within each of these sections:

- Upper Limb Movements
- Awkward Postures
- Lifting
- Pushes / Pulls
- Hand Forces
- Keyboard Use
- Contact Stress
- Vibration
- Environment
- Control Over Work Pace

Definitions and diagrams of these risk factors are provided in Appendix E.

Using the Checklist
The ERF checklist can be used in a two-step process, with the first step being performed now, during the *Hazard Identification* process; the second step will be performed in the *Hazard Assessment* process.

The two-step process for this checklist is as follows:

- **Step I - Exposure**: Check to see if the risk factor is present in the job.
- **Step II - Time**: Determine how long or how much the person is exposed to the risk factor.

Once you have reviewed the definitions for the risk factors, your task for *Hazard Identification* is to fill out the column with the heading:

> Exposure: Is the risk factor present within the job or task?

You will need to go out on the plant floor and watch the worker performing the job. You can work your way through the list and check off whether each risk factor is present or not.

There is one simple rule that you should use when analysing any risk factor:

> If you are not sure if the factor is present or not, say YES or pick the higher category.

In other words, if you think the person is exposed to the risk factor, but you are not sure, then your answer should be **YES**. If you think the person is bending almost 20°, and this is the limit for the risk factor, say that they are exposed. Basically, if you are unclear about any exposure decisions, always chose the side that represents the higher level of exposure. You do not want to underestimate how difficult a job is, and potentially miss something that needs to be corrected. As you work through the *Hazard Assessment* process, any uncertainties will work themselves out.

Hazard Identification Part IIIb
If you mark any of the risk factors as YES, then you can say that there is an indication of an ergonomic hazard.

5.1.6 Prioritizing Jobs for Assessment

The next step in the *Hazard Identification* process is to prioritize the jobs for assessment. The purpose of this step is to rank all the jobs in the plant from lowest to highest level of risk. Once you have done this, you can then focus your efforts on those jobs that are the most hazardous.

Once you have gathered the information to identify the problem jobs within your plant, you can now rank the jobs (or departments) based on level of hazard. You will be using the information you have gathered through your *Analysis of Records*, *Worker Consultation*, and *Direct Observation*. Even if you have not been able to collect information using all of the three methods, you can still use this process to prioritize your efforts (Note: the more methods you use, the better your analysis will be).

The following method can be used to rank the level of ergonomic hazard within each job:

1. Review the information you have for each job, and determine whether there is an indicator of an ergonomic hazard. You can use the decision criteria presented at the end of each section to guide you.

The decision criteria are found in boxes on pages 5-6, 5-7, & 5-9.

2. Use Table 5.1 to determine the ranking for each job.
3. Use additional criteria to break any ties (i.e. many jobs with the same rank).

Table 5.1: Ranking of Jobs based on Hazard Identification Techniques

Ranking	Indicators
1	Positive indication of hazard from all three methods
2	Positive indication from 2 of 3 methods
3	Positive indication of hazard from any 1 method

If you find that you have a large number of jobs with the same ranking (i.e. many jobs with a hazard ranking of 2), you can use other meaningful criteria to help break the tie.

Tie Breakers:

- Lost days: A job or department with a higher number of lost days should be looked at first.
- Persons affected: The more people affected by a hazard, the higher the priority for intervention.
- Multiple risk factors: A job with a higher number of risk factors will have a higher level of hazard.
- Complexity: If an area is very complicated to deal with, then it may be a good idea to focus on a simpler problem to gain some early successes.

5.2 HAZARD ASSESSMENT

Once you have identified the jobs that have ergonomic hazards, the next step in the process is Hazard Assessment.

You now know that your workers are being exposed to a hazard, but it is important to determine the level of hazard you are dealing with. When you are deciding to implement changes in a plant, you will want to consider which jobs or areas of the plant are placing your workers at the highest risk.

The three critical parameters that must be considered in the assessment of exposure to a risk factor are:

1. Intensity
2. Duration
3. Frequency

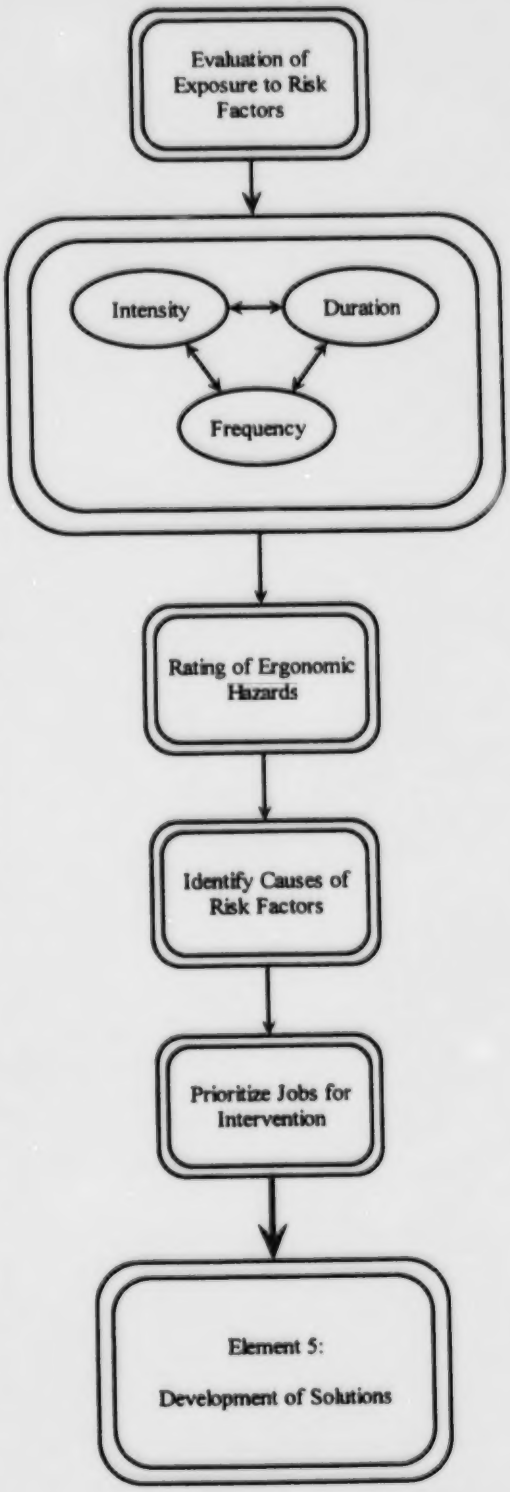
These three factors will interact with each other to determine the exact level of hazard present. A checklist of ergonomic hazards is provided in this section which will help you evaluate your jobs, and provide you with a hazard score for each job.

You can use this hazard score to identify the jobs in your plant that are placing your workers at the greatest risk of developing a WMSD. The ratings of the individual hazard items within the checklist will help you determine what parts of each job are contributing to the overall hazard.

Once you know what the hazards are, you can look back at the job to identify what are the possible causes of these hazards. If you can pinpoint the main causes, this will help you develop effective solutions.

Before you move on to solution development, you will want to prioritize your jobs for intervention. You will need to consider costs, time, feasibility, and the size of the hazard when deciding where you will want to start.

Once the jobs are prioritized, you are ready to move on to *Development of Solutions*.



The purpose of hazard assessment is to determine if any identified risk factors are a risk to the health and safety of workers. Now that you know a risk factor is present, you must decide whether it is of a sufficient magnitude to cause concern.

If the task is assessed as a risk to health and safety, proceed to the next section of this guide, *Development of Solutions*, for further information on hazard control. Hazard assessment should be carried out in consultation with workers and worker representatives.

Hazard assessment is particularly critical whenever:

- An injury has occurred due to a work process and/or practice; and
- A work process and/or practice is introduced or modified.

Key points to remember when assessing an ergonomic hazard are:

- Duration of exposure affects the potential for it to cause injury; and
- Exposure to multiple risk factors may further increase the likelihood of an injury.

Upon assessment of the tasks, you will most likely find connections between the risk factors you identify and the types of symptoms uncovered in your records review. You may, however, discover some hazards that have not caused problems yet. Incorporating the correction of these observed hazards into your program will help you to develop a more proactive approach.

5.2.1 Evaluation of Exposure to Risk Factors

During *Hazard Identification*, you identified the ergonomic hazards in the jobs using either the PDD or the ERF checklist. To evaluate the exposure to these risk factors, you will now use the ERF checklist, only. If you used the PDD in the identification process, then the steps provided below will show you an easy method of transferring this information to the checklist for evaluation.

5.2.1.1 ERF Checklist

If you used the ERF checklist to identify the hazard, then you worked through the column on the checklist called "Exposure". In this column, you indicated with a Yes/No response whether the individual risk factor is present in the job. The next step in the process is to fill in the section of checklist called **Time** for those factors you indicated were present.

This portion of the analysis is a little more complicated, but here is the general idea:

> Your goal is determine how much time in each job the worker is exposed to the risk factor. If the job takes 10 minutes to complete, and you determine that the worker spends 3 minutes bent over the workbench, then you can say that the worker was exposed to the risk factor for 30% of the job.

There are three levels of exposure within the Time analysis:

1. 0-24% of Job
2. 25-49% of Job
3. 50-100% of Job
   * additional risk is assigned to overtime.

For each risk factor there is a score applied to the level of exposure which ranges from 0-3, with the size of the risk increasing as the score increases. Depending on what you are measuring, the size of the risk is distributed differently. Basically, your body can tolerate being exposed to certain things longer than it can for others.

The challenge here is to find a way to measure how long a person is exposed to each risk factor. The following techniques will help you perform this task:

Cycle Time: Whenever possible, determine how long it takes to perform a task or job. If you know the total time to finish something, then it will be easier to measure how long the worker is exposed. The 3 levels of Time are generous, so this will allow you to make reasonable judgements; if you are not using a stop-watch, you should make your judgements using at least 2 people to create a consensus.

Work Sampling: If the job does not have a repeating cycle, or if you do not have time to watch the person work for an extended period of time, then you can use a technique called work sampling. This technique involves periodically viewing the task and marking down what the worker is exposed to while you are there. You will want to try to visit the job during different times of the day to get a good representation of the job. You can simply use the checklist, and tick off which factors the person is exposed to during each viewing. The Time factor would be the ratio of ticks to measurements. For example:

> You decide you are going to visit a job on four different occasions and spend 15 minutes each time viewing the job. While viewing the job, you make a pass through the checklist every 3 minutes. Therefore, you have a total of 20 measurements. For each risk factor, you count up the number of ticks, and divide by 20. The percentage you get can be applied directly to the checklist.

Videotaping: Videotaping a job allows you to view the activities at a later date, track improvements/changes in jobs, allows for slow motion viewing and gives observers the opportunity to study specific sections many times if necessary. You will need to use videotape if you are trying to analyse fast paced jobs, or tasks that involve quick hand movements.

When you have determined how long the worker is exposed to each risk factor, you enter the corresponding score in the column to the right. This is your **Individual Risk Factor** score.

When you have analysed all of the risk factors, you add up the scores to get the **Total Risk** score for the checklist.

5.2.1.2 PDD

If you used the PDD to identify the hazard, then you will now evaluate your Trigger Risk factors using the **Time** section of the ERF checklist. A method of easily converting your PDD information to the checklist is provided below.

In the *Hazard Identification* step, you looked at the demands on the PDD and determined if the job contained any Trigger Risk Factors. Each Trigger Risk Factor found on the PDD corresponds to a risk factor found on the ERF. You can use the table below to match the risk factors from the PDD with those on the ERF. Once you have determined which portions of the ERF checklist match up with your PDD analysis, you should then use the instructions provided above (5.2.1.1) to fill in the checklist.

PHYSICAL DEMAND	CHECKLIST	RISK FACTOR NUMBER
Strength		
Lifting	Manual Handling	# 34, 35-41, 44 (if lift >10 lbs.)
Carrying	Manual Handling	# 42 - 43
Pushing/Pulling	Back/Lower Extremity	# 31 - 32
Handling	Upper Extremity	# 1 - 2
Gripping - Power	Upper Extremity	# 5
Gripping - Pinch	Upper Extremity	# 6
Reaching	Upper Extremity	# 1 - 2
Postures		
Shoulder	Upper Extremity	# 8
Hip	Back/Lower Extremity	# 26
Wrist	Upper Extremity	# 9 - 10
Trunk	Back/Lower Extremity	# 18 - 21
Neck	Upper Extremity	# 7
Mobility		
Sitting	Back/Lower Extremity	# 22, 23 (if sit without back support or feet unsupported)
Standing	Back/Lower Extremity	# 23 (if standing stationary)
Crouching, Squatting, Kneeling	Back/Lower Extremity	# 25
Balancing, Foot Action - one foot	Back/Lower Extremity	# 24 (if balancing on one foot during foot action)
Foot Action - one foot - feet	Back/Lower Extremity	# 27 (if repetitive ankle flexion/extension during foot action)
Fine Finger Movements	Upper Extremity	Examine grip and upper limb movements and score accordingly
Sensory/Perceptual		
Keying/Typing	Upper Extremity	# 3, 4

PHYSICAL DEMAND	CHECKLIST	RISK FACTOR NUMBER
Work Environment		
Hot, Cold, Humid, Radiant/Thermal Energy	Upper Extremity	# 16
Vibration - localized, whole body	Upper Extremity, Back/Lower Extremity	# 13, 14 - upper limb, whole body
Vibration - whole body	Back/Lower Extremity	# 30
Contact Stress - hand/arm, lower limb	Back/Lower Extremity Upper Extremity	# 11 - hand/arm # 28 - body/leg
Striking with hand/fist	Upper Extremity	# 12
Conditions		
Machine Paced, Production Quotas, Deadline Pressures	Upper Extremity Back/Lower Extremity	# 17, 33
Irregular/Extended Hours	Back/Lower Extremity, Upper Extremity	All sections #1 - 16, #18 - #32 (if job time is >8 hours)

5.2.2 Rating of Ergonomic Hazards

You have now performed a *Hazard Assessment* and have a checklist with a list of numbers, or a pile of checklists sitting on your desk. What do you do next?

The scores provided on the checklist are there to help you prioritize your efforts towards solving any problems. Once you have completed a checklist for a job, or analysed a number of jobs within your plant, your next step is to prioritize.

Prioritization can be performed using two pieces of information available on the checklist:

1. Individual Risk Factor scores
2. Total Risk scores

5.2.2.1 Individual Risk Factors

If you are looking at an individual job, you will want to use the individual risk factor scores. You can use the following criteria to evaluate the individual scores:

- The higher the value for a risk factor, the greater the risk of developing an injury
- The more risk factors with a higher score, the greater the risk

You can prioritize your efforts for improving this job by making a list of your risk factors based on their ratings. You will want to address the individual risk factors with the higher scores first, and then continue down the list. When you are developing your solutions,

you will want to make sure that you have addressed the risk factors with the higher scores.

5.2.2.2 Total Risk

The total risk scores for the checklists have two main uses within your analysis:

1. Provide a measure of risk
2. Prioritize your efforts when looking at several jobs

Measure of Risk

Your first concern when looking at a job should be to reduce exposure to any individual factors that have a score of 3 or more. When looking at the overall hazard level for a job, you can use the Total Score for each checklist (i.e. Upper Extremity score, and Back and Lower Extremity are evaluated separately).

A job is considered hazardous if: Total Risk score >= 7

***Note:** A score < 7 on this checklist does not indicate that a job is safe. If there is a single risk factor with a score > 3, then it should be addressed. Additionally, this checklist only addresses ergonomic factors; you still need to consider all safety factors. An analysis will not always catch rare or unique components of a job, and these can contribute to an injury. Finally, certain individuals may be susceptible to injury at lower levels of exposure.

If you have any concerns, please contact Workplace Safety and Health for assistance.

Prioritize Your Efforts

The second use of the Total Risk score is to prioritize your efforts. When you have analyzed multiple jobs within a plant, you need a way to choose where you should begin your solution development process. This decision is based on two key factors:

1. Risk to Health
2. Feasibility of Changes (this factor will be discussed later in the guide: see 5.2.4)

Risk to Health
To prioritize the jobs based on risk to health, all you have to do is sort the jobs based on the Total Risk score on the checklist.

The Higher the Score, the Greater the Risk

If you have many jobs with the same score, then you can use the Individual Risk Factor scores to break the tie.

5.2.3 Identify Risk Factor Causes

Identifying the causes of risk factors is one of the primary goals of an ergonomics program. If the causes are not determined, then solutions to the problem cannot be developed effectively. The team needs to determine whether the risk factor is caused by the:

- method used / required to do the task;
- effort or strength required to do the task;
- location of parts, equipment or tools;
- position of parts, equipment, or tools;
- speed or frequency of the work;
- duration or repetition of the tasks;
- design of the parts, equipment or tools;
- environmental factors, such as light, noise, temperature and air quality.

Risk factors may create hazards individually or in combination with others. Videotaping the job will allow the ergonomics team to confirm the risk factors identified by other sources. A combined review that uses two or more tools will increase the chance of determining all the causes, and will also help in the development of solutions to the problems. The next section describes the types of solutions you may use.

5.2.3.1 Ergonomic Facts

The following ergonomic facts may guide in determining some potential causes:

- Workers may be forced to adopt sustained, inappropriate and awkward body positions with work heights that are too low or too high.

- Displays may be placed where they cannot be easily seen, or frequently used controls, tools and materials may be placed beyond easy reach. Such workstation layouts may result in inappropriate positions, such as bending to one side or twisting the body, which increase the risk of injury.

- Risk of injury is increased:
  - where the work height varies significantly from optimum level;
  - where there are frequent actions which require extremes of reach, bending or twisting;
  - when maintaining a single posture for long periods, for example, sitting or standing;
  - when holding fixed body postures unsupported, for example, sitting without back support; and
  - when using poorly designed tools.

- Work heights:
  - For most work, the optimum working height is at elbow level.
  - For precision or close work the optimum working height is a little above elbow level and at a comfortable visual distance. Optimal working height also requires a comfortable posture with elbows supported (on the work surface or arm rests) for stability.
  - The optimum working height for work requiring forceful movements is a little below elbow level.

- Therefore, whenever possible, tasks should be varied within a shift to allow different muscles to be used and tired muscles to recover. The more varied the tasks, the lower the risk of injury.

- The application of force, when used to move, restrain or hold a posture, requires muscular effort.

- Meeting tight deadlines and peak demands will increase time pressures, reduce control over workflow and may contribute to risk of injury. Bonus and piece rate systems through their effect on work rate and work organization can be associated with injury.

5.2.3.2 Organizing Your Efforts

You can use a table to help summarize your ideas. The example below illustrates some possible causes of risk factors on an assembly line. The table provides room for you to work on your solutions for these causes; this process (i.e. Effectiveness Rating) will be continued in the next element – *Development of Solutions*.

Affected Body Part	Root Cause	Severity of Risk Factor	Possible Solution	Effectiveness Rating
Right wrist	Ulnar deviation due to high conveyor	High (3)	Lower conveyor	
			Use alternate hands	
	Pinch grip due to slippery product	Moderate (2)	Provide water wash for hands	
Right shoulder	Long reach to the container	High(3)	Use alternate hands	
			Use guide to slide empty tray close to the worker	
Lower back	Standing	Moderate (2)	Use lean stand (sit/stand)	
	Forward leaning posture when reaching to container	High (3)	Use guide to slide empty tray close to the worker	
Feet/legs	Standing	Moderate (2)	Use anti-fatigue mats	

5.2.4 Prioritize Jobs for Intervention

You now have the following information:

- Risk factors present within a job
- List of probable causes of the risk factors

The next step in your process is to prioritize your efforts based on the *Feasibility of Changes*. If you have several jobs that are hazardous, you should prioritize your efforts based on how effectively you can address the problems. If a job is listed as being hazardous, you must make an effort to reduce exposure to the risk factors that are creating the hazard.

You will need to look at:

- Severity of the hazard;
- Complexity of the causes;
- Potential costs of changing a work area;
- Future changes to the facility or process;
- Availability of technology to address causes.

Once you have reviewed your situation you can prioritize your jobs for solution development based on two key principles:

1. If the problem is simple, fix it. This will demonstrate that your ergonomics team is trying to help, and generate a positive atmosphere within the plant.

2. If the problem is more difficult, prioritize these jobs for intervention. You should set a schedule based on the above factors to ensure that all hazardous jobs are dealt with.

Now that you have *Identified the Problem Jobs*, your next step in the program is *Development of Solutions*.

6.0 DEVELOPMENT OF SOLUTIONS

Development of Solutions is the process of eliminating or reducing assessed risk factors and should be carried out by the employer, the workers doing the task and worker representatives.

This section sets out the options for risk control, and provides detailed guidance on those options. The three levels of control measures are:

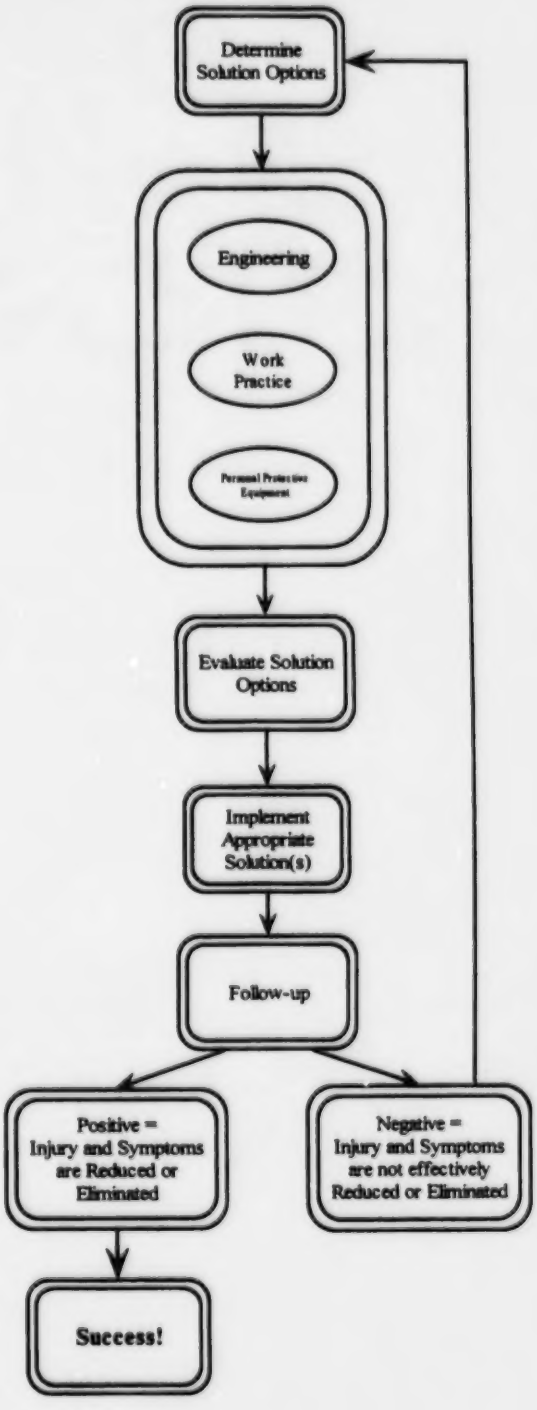
1. Engineering Controls
2. Work Practice Controls
3. Personal Protective Equipment

You will need to evaluate the controls that are feasible for each problem. Removal of the risk from a task is the optimum control solution. This may be achieved by re-designing the equipment or work practices. If removing the risk is not workable, re-design of the equipment or the system of work to reduce the risk is the next option. If re-design is not workable, provide and maintain any device that will assist workers to carry out their tasks without risk of injury. If none of the above controls are workable, provide training in methods of carrying out the task to reduce risk of injury. In certain circumstances, personal protective equipment can be used as an interim solution or to assist in reducing exposure to the risk factor(s).

Once you've chosen the best solution, the next step is to implement and see what happens. You must provide enough time for people to adjust to the change, and the proper training and education for them to safely adopt it.

You will need to follow-up at a later date to see if your solution has worked. Have the risk factors been reduced or eliminated? Have any new ones developed? Have symptoms and injuries been reduced or eliminated?

If your evaluation is negative, then you will need to evaluate the chosen control. Are there any reasons the control did not work? Are there any other options you can try? If your evaluation is positive, then your solution(s) is a success.



6.1 DETERMINE SOLUTION OPTIONS

After *Identification of Problem Jobs*, the next step is to generate solutions that reduce or eliminate exposure to these risk factors.

Methods for identifying possible solutions vary depending on the complexity of the risk factors identified. In some cases, a well-identified root cause may lead directly to a single solution (e.g., the sudden onset of several cases of tendinitis can be clearly linked to the use of new sub-assembly parts that fit too tightly, resulting in a change back to the original supplier). In other cases, the job may have multiple risk factors that affect several different body parts, requiring the identification and implementation of many simultaneous controls.

The following strategies can be used for identifying solutions:

6.1.1 Examining Original Design Specifications

Reviewing original design specifications may help to determine whether the job, equipment, tools, or raw materials have substantially changed. If changes are identified, then a return to the original situation may correct the problem (e.g., preventive tool maintenance).

6.1.2 Brainstorming

Brainstorming with a small group, including the workers who perform the job, can be used to identify many possible solutions, especially for complex problems. Some guidelines for effective brainstorming include:

- Involve everyone in the group.
- List all the ideas.
- Don't critique the ideas at the time they are generated; criticism leads to fewer ideas.
- Encourage creativity and new ideas; the more ideas the better.

6.1.3 Analyzing Similar Operations

Reviewing similar operations, especially at sister worksites, often identifies process improvements that have evolved over time and thus are not immediately apparent as solutions.

6.1.4 Consulting a Specialist

A specialist in materials handling, warehousing, layout, work methods, or ergonomics may be able to provide solutions based on experience. Many large organizations have such specialists on staff. Many of these types of specialists are available within the community.

6.1.5 Reading Equipment Catalogues

Equipment catalogues, especially those dealing with the types of problems that may be faced within your worksite, may provide solutions. For example, if a problem exists in handling drummed materials, some catalogues offer equipment that aids in the handling of drums. Beware of such labels as "ergonomically designed"; a piece of equipment can be considered ergonomically designed if the requirements of the job and the capacities and limitations of the workers are taken into account in the design.

6.1.6 Talking With Vendors

Vendors who work within a particular industry may be able to share ideas from other operations. Developing a partnership with a vendor to work collaboratively to resolve the problem may be useful.

6.1.7 Talking With Trade Associations or Labour Unions

Discuss the problem with a trade association or a labour union. These organizations may serve as a focal point for efforts to initiate changes within the industry. These groups may be able to provide a list of good ergonomic practices.

6.2 CHOOSE TYPE OF SOLUTION

After you evaluate the job and identify the specific problems, you can eliminate or reduce the risk of injury using various control measures. Personal characteristics of the workers such as size, physical condition or medical history may need to be accommodated to make the best fit.

It is likely that, for many jobs, the application of these types of controls will not be mutually exclusive. In some jobs, it may be appropriate to redesign some parts of the job process, in addition to providing mechanical aids.

6.2.1 Engineering Controls

Engineering controls involve making changes to the workstations, tools or equipment used on the job. These controls are preferred over all others because they make permanent changes that eliminate hazards at the source. Although they can be more expensive to implement than other controls, their effect is often more significant which can translate to a larger benefit in the long term. To help generate solution ideas, a list of engineering control options is provided in Appendix G.

It is most cost effective to reduce risk factors at the design stage. Additional costs are incurred in redesigning or modifying the plant or processes once they are being used in the workplace. The aim of job design is to take into account all the factors which affect the work, and to design and arrange the work content and tasks so that the whole job is without probable risk to the health and safety of the worker.

6.2.2 Work Practice Controls

Work practice controls are procedures for safe and proper work that are used to reduce the duration, frequency or severity of exposure to a hazard. Standard operating procedures should allow for enough workers to complete the tasks safely and should be a regular part of the way you do business. When defining safe work practice controls, it is a good idea to ask workers for their ideas, since they have firsthand experience with the tasks. These controls should be understood and followed by managers, supervisors and workers.

Improved maintenance may reduce the risk of injury. Equipment which has been regularly maintained to specification, for example, a mechanical part which has been regularly oiled, may require less force to activate, thereby reducing the risk of injury.

The use of task-specific (particular) training as a control measure applies in the situation where risk factors have been assessed and it has not been workable to carry out job modification or to provide and use mechanical aids to reduce the risk.

6.2.2.1 Work Methods Training

Workers should be taught how to perform their jobs with the lowest physical stress and best posture, as well as how to handle materials, tools and equipment safely.

6.2.2.2 Gradual Introduction to Work

New and returning workers in jobs involving risks, such as prolonged repetitive motion, should be introduced gradually to a full workload to improve work capacity and prevent injury. (See Medical Management: section 7.0)

6.2.2.3 Monitoring

Review all jobs regularly to see if specified safe work practices are being used. Work techniques should be reviewed periodically to ensure that they reduce risks.

6.2.2.4 Recovery Pauses

Regular recovery pauses can help prevent eye strain, headache, neck, back, shoulder, arm or hand pain. Workers can perform activities that involve different muscle groups during these pauses.

6.2.2.5 Job Rotation

If possible, job rotation should be used to prevent injury, not as a response to it. Also, job rotation should generally be used as an intermediate solution while you work on other solutions. Workers should be rotated into jobs using different muscle-tendon groups to prevent fatigue.

6.2.2.6 Job Design

Your company should look at ways that jobs can be (re)designed to incorporate good ergonomic practices. These include providing relief from frequent repetitive motions,

static or awkward postures, excessive forceful exertions, and mental and muscular fatigue.

Work methods should be designed so work can be completed safely and comfortably, and factors contributing to work-related musculoskeletal disorders are minimized. Machine pacing poses a risk if the pace is too fast or too slow. Alternatives should be considered. If alternatives are not workable, then buffer zones are an effective way to reduce risks from machine pacing, and to enable the worker to control the flow of work. An example of a buffer zone is a system which allows items to be taken off the production line when it is moving faster than the worker's comfortable pace so that the worker can process it later. A production line which allows the worker to process items at their optimal pace has the same effect as a buffer zone

6.2.2.7 Maintenance and Housekeeping

Regular maintenance is critical to ensure that your workers have tools and equipment that are in proper working order and perform to expectations. Equipment that is not maintained and cleaned can make regular operations more difficult. Worn-out tools should be replaced; dull tools should be sharpened. Housekeeping should be done as often as necessary to reduce ergonomic hazards.

6.2.2.8 Work Rates

The capacity of workers should be considered in establishing production goals. Increased work rates, excessive overtime and incentive programs for piece work can cause fatigue, increasing the chance for injury.

6.2.3 Personal Protective Equipment

Personal protective equipment (PPE) includes such things as gloves and knee pads that may help reduce hazards until other controls can be put into place, or to supplement existing controls. The PPE must fit the worker, be appropriate for the task being done, and not result in awkward postures or increased force requirements. Remember, however, that eliminating a hazard is preferable to using PPE.

6.2.3.1 Gloves

Gloves can protect the hands from injury, vibration or cold, but they also may reduce dexterity and increase grip force. When choosing gloves, consider these factors:

- Gloves should be small enough to minimize wrinkling or slipping, but large enough so that they don't impede circulation.
- Padding or insulation can add protection.
- Texturing improves friction.
- If chemical resistance is not a concern, material should be breathable so perspiration is not trapped.

6.2.3.2 Footwear / Anti-fatigue Insoles

Anti-fatigue insoles can give relief from musculoskeletal fatigue that develops from prolonged standing and walking on hard floor surfaces. They are especially appropriate

when anti-fatigue floor mats cannot be used because of housekeeping needs, the size of the area to be covered, or tripping hazards.

6.2.3.3 Knee Pads

Knee pads can be used to avoid prolonged contact with hard or sharp surfaces. They should be comfortable, large enough to cover the entire knee, padded, and snug enough to fit well but not so tight that they impede circulation.

6.2.3.4 Wrist Splints/Braces

A wrist splint/brace is good for assisting people with certain types of problems, but if used incorrectly this type of splint can make an injury worse. A brace is designed to limit movement when excessive movements or force may create or exacerbate an injury. If the person tries to move against the brace or if the brace is pinching part of their arm, then the problem could get worse. A health care professional should always be consulted to determine if a wrist brace would be useful, or if some other solution is better.

6.2.3.5 Back Belts

Research to date on the use of back belts to decrease the risk of injury is inconclusive - they work for some of the people some of the time, but not all of the people all of the time.

Here are a few recommendations to follow if you are considering using a back belt:

1. **Be sure to consult with a physician prior to use.** Medical personnel should screen all candidates for cardio-vascular risk.
2. **Belt wearers must receive education on lifting mechanics and proper use of the belt.** The use of back belts can lead to a false sense of security, which could lead to overexertion and unsafe activities.
3. **Belts must not be prescribed until a full ergonomic assessment has been conducted of the individual's job.** Focus on the development of a company wide comprehensive ergonomic program.
4. **Belts should not be considered for long-term use.** Fitness, education on lifting mechanics and ergonomic assessments are the three primary factors that should be used to ensure a safe work environment. It is recommended that workers be monitored closely upon termination of belt use as this period appears to be characterized by elevated risk of injury.

6.3 EVALUATE SOLUTION OPTIONS

The best approach is to select from the list and implement the solutions or combination of solutions that address the most risk factors or the most serious risk factors.

The selection process may involve ranking the criteria to identify the most effective solutions. Graphical comparisons are often useful when comparing alternate solutions. Criteria used to evaluate solutions include:

6.3.1 Effectiveness

Effectiveness is the degree to which the solutions control the risk factors. Effectiveness can be evaluated on a four-point scale:

1	risk factors completely eliminated
2	[illegible]
3	some risk factors eliminated
4	few or no risk factors eliminated

To demonstrate the use of this scale, the following table provides the ratings of possible solutions for an example task of handling large containers on a packaging line:

Rating	Possible Solution
[redacted]	Building a powered conveyor into the production line
[redacted]	Using roller conveyor, worker still must apply push force
	Adding cutout handles to packages, thus allowing worker to hold packages closer to the body
[redacted]	Instructing worker to request help when needed for handling heavier packages

In situations where risk factors affect multiple body parts, it is necessary to evaluate the effectiveness that a solution has on each affected body part. The following table provides an example of the rating of solutions for a problem affecting multiple body parts. As you can see, multiple solutions may be necessary to address all risk factors identified in a job.

Affected Body Part	Root Cause	Severity of Risk Factor	Possible Solution	Effectiveness Rating
[redacted]	Ulnar deviation due to high conveyor	High	Lower conveyor	1
			Use alternate hands	3
	Pinch grip due to slippery product	Moderate	Provide water wash for hands	2
[redacted]	Long reach to the container	High	Use alternate hands	3
			Use guide to slide empty tray close to the worker	1
[redacted]	Standing	Moderate	Use lean stand (sit/stand)	2
[redacted]	Forward leaning posture when reaching to container	High	Use guide to slide empty tray close to the worker	1
[redacted]	Standing	Moderate	Use anti-fatigue mats	3

6.3.2 Timeliness

Timeliness is the overall time before the risk factors are reduced or eliminated. This is usually the time it will take to fully implement a solution, including the time required for the solution to effectively work (e.g., with a work-methods change, the workforce may not fully embrace the new method until well beyond the training period). If an engineering control must be designed and implementation is several years off, then an interim solution(s) should be implemented. Often a simpler engineering control or an administrative control may be implemented while a better solution is designed.

6.3.3 Worker Acceptance

Whether or not workers accept and use the solution also determines its effectiveness.

6.4 IMPLEMENT APPROPRIATE SOLUTION(S)

Implementation normally consists of a trial or test of the selected solutions, appropriate modifications or revisions, followed by full-scale implementation.

Testing or evaluation verifies that the proposed solution actually works and identifies any additional enhancements. Workers who perform or will be performing the job can provide valuable input into this testing process. Testing can be done in several ways:

- A mockup of an improved workstation can provide an understanding of the work space, reaches, and clearances;
- A single workstation can be modified first, thus ensuring that all necessary changes have been identified before full-scale changes to multiple workstations occur;
- Improved work methods can be tested on training lines or training workstations. Typically, these workstations have slower speeds or are completely off-line and can be stopped; thus, they are ideal for testing purposes.
- Tests on full-speed production lines can be done by inserting an extra workstation, then having a worker perform the new work method or use the new tool at a reduced rate. For example, on a poultry processing line, the operator trying a new method for thigh de-boning may actually work on only one-fifth of the birds that would normally be processed.

During this testing period, the employer or team members may perform interviews or use body-part discomfort surveys (see Appendix A) to learn how well the proposed solution actually works and to identify any additional enhancements. Involving workers in this testing stage and using their feedback on the proposed solutions are essential.

After the initial testing period, the proposed solution may need to be revised. Further testing should be conducted to ensure that the correct changes have been made. Other steps of the problem-solving process may need to be repeated, such as a more detailed assessment or development of other solutions. Full-scale implementation should follow complete testing of the proposed solutions. Planning is critical to ensure timely implementation; this consists of designating the personnel involved, creating a timetable, and considering the logistics necessary for implementation.

6.5 FOLLOW-UP

A follow up evaluation is necessary to ensure that the implemented solution(s) successfully controlled the job and did not introduce new risk factors.

A job is considered effectively controlled if:

1. The risk-factor checklist score is 5 or less on the provided checklist; and
2. It can be demonstrated through a job analysis that the risk factor exposures have been reduced (individual score < 3) or eliminated;

AND

3. the number of injuries and/or symptoms have been reduced or eliminated.

If the job is not controlled, then the problem-solving process is not complete. In addition to verifying that the solutions worked, the follow up process can identify ways in which the problem-solving process itself can be improved.

The follow up evaluation should include at least a risk factor checklist. The same risk-factor checklist that was used to initially identify the problem job must be used, with input from affected workers.

The follow up may also include the body-part discomfort survey (Appendix A), which can be completed in conjunction with the risk-factor checklist. The results of the follow up body-part discomfort survey can then be compared with the results of the initial body-part discomfort survey (if one was performed) to determine the effectiveness of the implemented solutions.

Because some changes in work methods (and use of different muscle groups) may actually make workers feel sore or tired for a few days, follow up should occur at least one to two weeks after implementation. Recognizing this fact may help to avoid discarding an otherwise good solution.

In addition to the short-term evaluation of the effectiveness of implemented solutions, long-term indicators of effectiveness include:

- Reduction in the rate of musculoskeletal disorders (# claims)
- Reduction in the severity rate of musculoskeletal (days lost)
- Increase in productivity or quality
- Reduction in job turnover or absenteeism.

7.0 MEDICAL MANAGEMENT

Implementation of a medical management system is an essential component of an employer's ergonomics program. Medical management is making the best use of available health care resources to prevent and control work-related musculoskeletal disorders. The goals of medical management are to:

- Promote prevention of injury and illness.
- Identify signs and symptoms as soon as they occur.
- Ensure proper evaluation and treatment of injured workers.
- Ensure safe and timely return to work for injured workers.
- Reduce the direct costs of injury and illness by decreasing time-loss and disability payments.
- Reduce the indirect costs of injury and illness by retaining workers and maintaining productivity.

The person responsible for your company's return-to-work program should perform the following:

- Understand and become familiar with the goals and structure of the medical management system.
- Gather, assess and provide any information as required for the prevention and early intervention of WMSDs.
- Work and communicate with the injured worker, health care professional, Workers' Compensation Board, effected supervisors and co-workers.

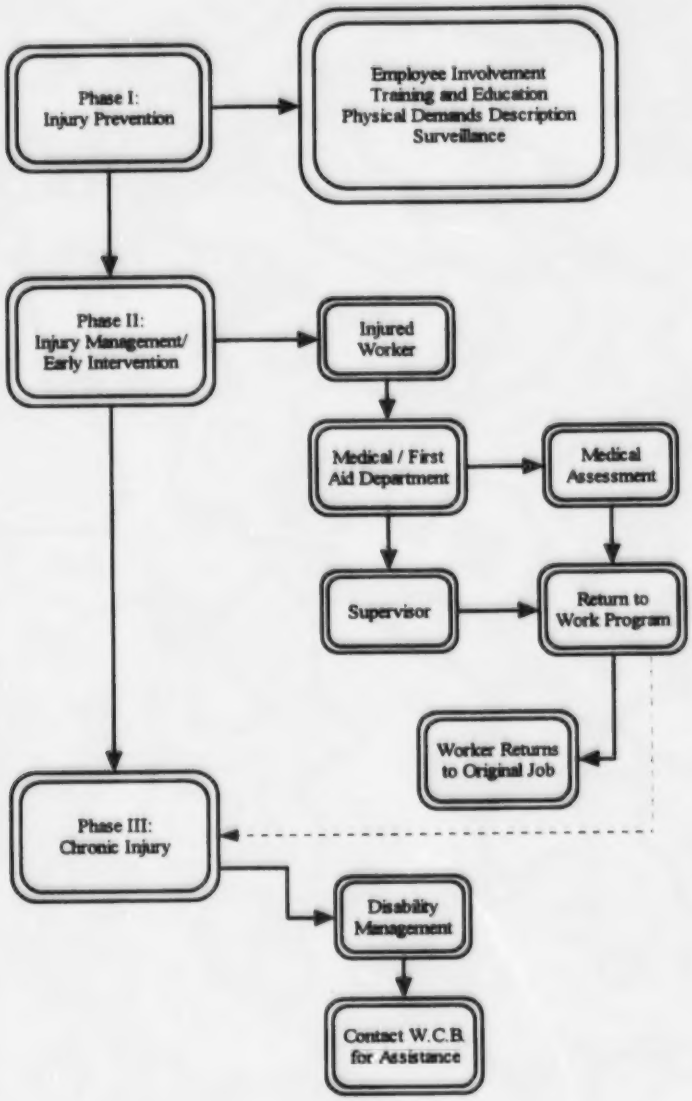
Managers, workers, worker representatives, claims representatives and health-care providers should work together to promote prevention of injury and illness, and to increase the probability of a positive outcome when injuries and illnesses do occur. To be successful, medical management requires regular communication and cooperation among everyone involved. Each work shift should have access to health care providers in order to facilitate documentation, treatment and return to work activities. Where such personnel are not employed full time, the part time employment of appropriately trained health care providers is recommended. A list of Health Care Professional Association contacts (section 8.0) has been provided to help you find the help you may need.

A medical management system is generally structured into three phases. They are:

- PHASE ONE:
  Injury Prevention

- PHASE TWO:
  Injury Management/Early Intervention

- PHASE THREE:
  Chronic Injury



7.1 PHASE ONE - INJURY PREVENTION

The prevention phase of medical management may already be a part of your company's accident prevention plan. Good ergonomic work practices will fit in well with your other safety measures. By focusing your efforts on prevention, you will help to ensure worker safety and reduce claim costs. The more effort spent on prevention in phase one, the less chance that injuries will occur and become disabling.

The methods discussed in the *Identification of Problem Jobs* and *Development of Solutions* sections are important in this phase of medical management. Specifically, identifying the risk factors in your workplace and implementing controls to eliminate them form the basis of your prevention efforts. Health-care professionals (see section 8.0), ergonomists, or consultants from Labour and Industries may be able to help you in this area. In addition, written job descriptions, a baseline symptom survey and obtaining worker suggestions as described below will make your prevention efforts easier.

7.1.1 Job Descriptions (Physical Demand Descriptions)

A Physical Demand Description (PDD, Appendix C) is an extended job description. It includes the physical requirements for a job such as lifting, kneeling, fine finger movements and strength demands. A PDD also includes job requirements such as sensory or perceptual demands, environmental demands and conditions of the work place. A PDD objectively lists everything that is required of the worker to perform the job. The PDD can be completed by members of the Safety and Health Committee, the ergonomics task team or area supervisors. The PDD should be checked by the workers who perform the jobs.

These physical demand descriptions have several uses in medical management. In returning an injured worker back to work, PDD's are used to match the injured workers functional abilities or job restrictions to the demands of the specific job. This way workers may be returned to a safe job that is within their capabilities. If there are any job demands that are beyond the capabilities of the injured worker, then the PDD can be used to identify and guide any possible changes.

The PDD's can also be used by the treating health care professional in order to have a better understanding of the job and therefore make better job capability recommendations. A rehabilitation program can be improved by having quantitative information about the job demands. A PDD also helps to ensure that workers, supervisors, and managers all have a similar understanding of the jobs.

7.1.2 Injury and Symptom Survey

An injury and symptom survey is one method for identifying areas or jobs where potential WMSD problems exist. The major strength of the survey approach is that you can collect information from a number of workers performing the same or similar jobs, and determine if they may be experiencing some form of WMSD. Reported pain symptoms by several workers on a specific job would indicate the need for further

investigation of that job. A standardized symptom survey can measure the extent of symptoms of work-related disorders for each area of the plant, determine which jobs are exhibiting problems and measure progress of ergonomic interventions. Surveys normally will not include employees' personal identifiers; this is to encourage employee participation in the survey. Conducting the survey annually should help detect any major change in the prevalence, incidence, and/or location of reported symptoms.

7.1.3 Job Improvement Suggestions

Encouraging workers to make job improvement suggestions also will help your prevention efforts. In the daily performance of their jobs, your workers will readily discover ways to improve ergonomic safety. Their familiarity with the job's equipment, tools, processes and methods is the most direct source of ideas about prevention.

7.1.4 Gradual Introduction to Work

A gradual introduction to work is a process to progressively condition the worker to improved physical conditioning. The components of a gradual introduction to work may include exercise and stretching, aerobic training, education to teach the worker safe and productive ways to work, and or work simulation for self paced learning.

Gradually introducing a worker to the job may reduce the frequency of injuries but has a greater benefit in reducing the severity of the injury and in reducing the number of lost days. However, poor body mechanics, assuming awkward body postures and working without adequate rest pauses can lead to chronic problems later in time. Therefore a gradual introduction to work should be done in conjunction with a hazard assessment (page 5-11) to ensure ergonomic hazards are reduced.

7.2 PHASE TWO - INJURY MANAGEMENT/EARLY INTERVENTION

Phase two of medical management begins when a work-related musculoskeletal injury is reported.

A company can assist in this phase of medical management by doing the following:

- Ensure that prompt and effective medical management is available whenever an employee reports a WMSD;
- Provide prompt access to health care professionals for effective evaluation, treatment and follow up;
- Provide information to health care professionals to help ensure medical management is effective. This may include a description of a worker's job (PDD), any identified ergonomic risk factors, a description of any possible changes to the job or a list of temporary alternate duty jobs to fit the worker's capabilities;
- Follow the health care professional's written worker capabilities;
- Develop a return-to-work plan with the health care professional;
- Communicate the return-to-work plan to the worker, the worker's supervisor and the health care professional.

7.2.1 Injury management – documenting and tracking of WMSDs

When an injury occurs, the Workers' Compensation Board of Manitoba's injury report forms are to be filled out. To improve the internal documentation and tracking of injuries, more information is required:

- The location, workstation, or tools used which are believed to have caused or aggravated the injury.
- The number of lost days or restricted work days (days on modified work duty).
- An accident investigation should reveal the underlying cause of the injury such as lifting with a poor posture, poor housekeeping or poor training and awareness.

In order to track injury rates properly, the number of hours worked in the plant or by department should be tracked. This can be used to compute an incidence rate for new injuries or a severity rate for lost days.

$$IR = \frac{\text{number of new injuries X 200 000 HRS}}{\text{number of hours worked in the period by all workers}}$$

$$SR = \frac{\text{number of lost days X 200 000 HRS}}{\text{number of hours worked in the period by all workers}}$$

These statistics will greatly improve your tracking and provide important information for your ergonomics initiatives.

7.2.2 Seeking Appropriate Treatment

Workers and managers should be trained to recognize the signs and symptoms of musculoskeletal disorders, and what to do if disorders are discovered. Encourage your workers to report symptoms or potential injuries as soon as they are discovered and to seek prompt treatment. It is important to assure workers that when they report injuries, they will not be discriminated against. The sooner injuries are treated, the better chance you have to prevent a more serious problem.

Throughout an injured worker's recovery you (or the company's health care provider) should maintain regular communication with the worker and the health-care professional. This communication will allow you to follow the recovery progress so that problems may be dealt with quickly. A safe return to work should be your primary consideration. When treatment begins, you should talk about setting specific time frames to accomplish recovery goals with the health care professional.

7.2.3 Questions for Injured Workers to Ask their Health-Care Providers

Many employers and workers are not yet familiar with musculoskeletal disorders, their causes and their treatments. This unfamiliarity makes it difficult for an injured worker to

know what questions to ask the health-care provider about treatment. Asking the following questions can help give a thorough understanding of the injury/illness and what to expect from recovery:

- What is your diagnosis of my condition?
- Can you explain in non-medical language what that means?
- In your opinion, is this a work-related musculoskeletal injury/illness?
- How long does it usually take for this type of injury/illness to heal?
- What kinds of potential complications should I be aware of and watch for?
- What are my treatment options? What are the pros and cons of each?
- When should I expect to be back to full-duty work?
- What, if any, are the long-term implications of this injury/illness?
- What precautions should I take to avoid further injury?

The ergonomic program facilitator or company health care provider should encourage the injured worker to be an active participant in his or her recovery and to follow through on all treatment instructions. Show support and give encouragement throughout treatment. Coordinate return-to-work plans with the health-care professional and the worker to ensure that the plan is appropriate.

7.2.4 Modified Duty and Job Modifications

Meaningful modified-duty jobs are often a part of safe return-to-work plans. Before injuries occur, your ergonomics team should make a list of these jobs. You will then be prepared when a worker is released for return to modified duty.

Modified-duty jobs should have the least ergonomic risk. You may want an ergonomist or trained occupational health-care professional to help identify these positions. Coordinate with the injured worker and the health-care professional to be sure you follow the legal requirements for returning the worker to a modified-duty position that is appropriate for the injury. The job should not require the use of the injured area; inappropriate jobs can prolong recovery, re-injure or continue to injure the worker, or turn the present injury into a chronic injury. Coordination with the health-care professional is recommended to set reasonable time limits for modified duty with a plan for transition back to full duty. Transition time is an important part of a safe return to work, especially if the worker has been off work or on modified duty for more than six weeks.

The tools required for a return to work program include:

- A *list* of light duty jobs that can be performed upon return to work

- A *physical demand description* of the workers current job. To be used to determine the suitability of a worker returning to this job and if any accommodation measures can be incorporated into the current job. (A sample form is provided in the Appendix C).

- A *letter* to the treating physician concerning the return to work program at your facility. (A sample form is provided in the Appendix F).

- A *worker capabilities form* identifying the movements that the worker can perform, to be filled out by the treating health care professional. (A sample form is provided in the Appendix F).

- A *return to work form* identifying tasks and time elements which the injured worker is to perform. This can be developed with the assistance of a health care professional.

7.2.5 Challenges to a Successful Return to Work Program

7.2.5.1 Learning about Cost-benefits associated with a Return-to-Work Programs

Returning an injured or ill worker back to safe work has physical and psychological benefits for the worker. These benefits can greatly reduce the economic and non-economic costs associated with not returning an injured worker back to work. The factors you will want to review are the cost benefits, healing benefits, psychological benefits, and awareness for ergonomic improvements and other human resource benefits for a return to work program. A cost benefit analysis can show the productivity and financial benefits of returning an injured worker back to work.

7.2.5.2 Concerns over Productivity

The slowing down of production, the possible reorganization of work or the use of workers who are not fully recovered are some of the concerns that should be addressed before a return to work program is implemented. A training session discussing the ergonomics program and the return to work program as tools to prevent injuries, reduce their severity and improve productivity and quality will not only dispel concerns, but motivate workers to suggest ergonomic improvements.

7.2.5.3 Concerns with Returning an Injured Worker to Work

Co-workers concerns should be addressed and discussed to ensure a successful return of an injured worker. All workers should be educated about injury/illness. This should include the causes of injury/illness, what happens to the body following injury, the benefits of active rehabilitation and the reasons for the resumption of regular activity.

7.2.5.4 Cooperation with the medical community

A proper return to work program can have physical and psychological benefits to the injured worker. The medical community strives to protect the health of their patient. Therefore, a company should encourage the medical community to learn, visit and communicate with the company and its return to work program. Health Care Providers should be given Physical Demands Descriptions of the injured worker's current job and any light duty jobs that may be performed by the injured worker. This may relieve any concerns the medical community has about allowing an injured worker to return to work.

7.2.5.5 Dealing with Change

A program that is well planned, executed, communicated and addresses concerns ahead of time will be successful. With the changes that may occur within a company because of the ergonomics program, there may be concerns with such things as productivity, how to accommodate an injured worker and the cost of accommodation. Having case studies from other workplaces showing cost savings, improved morale and increased productivity will assist in understanding the benefits of change.

7.3 PHASE THREE - CHRONIC INJURY

The best way to keep injuries from moving into phase three is to focus your efforts on prevention and injury management. However, some workers' injuries may become chronic. In these cases, your goals should be to ensure return to work without further complications and to prevent disability. Refer to the Workers' Compensation Board of Manitoba for details regarding chronic injury management.

Chronic injury intervention should begin under one or more of the following conditions:

- Worker has not returned to work.
- Worker has not returned to work and does not show demonstrated improvement from phase two.
- Worker has returned to work with limited duties, but without full recovery.
- Worker has been released for work, but non-physical barriers have prevented return to work.

Cases that move into this phase are often complex and confusing to both the worker and the employer. At this point, the worker may have seen several health-care providers and undergone several types of treatments. Because of this potential for complexity, communication and cooperation among the worker, employer, claims manager, and health-care providers are especially important in dealing with chronic injury.

8.0 CONTACTS AND REFERENCES

8.1 CONTACTS

Manitoba Labour
Workplace Safety and Health Branch
200-401 York Avenue, Winnipeg, MB, R3C 0P8
Client Service Desk: (204) 945-6848
Toll Free (in Manitoba only): 1-800-282-8069
Website: www.gov.mb.ca/labour/safety

Workers Compensation Board of Manitoba
333 Broadway, Winnipeg, MB, R3C 4W3
Phone: (204) 954-4922
Toll Free (in Manitoba only): 1-800-362-3340
Website: www.wcb.mb.ca

MFL Occupational Health Centre
102-275 Broadway, Winnipeg, MB, R3C 4M6
Phone: (204) 949-0811 Fax: (204) 956-0848
E-mail: mflohc@mflohc.mb.ca
Website: www.mflohc.mb.ca

HEALTH CARE PROFESSIONAL ASSOCIATIONS

Association of Occupational Therapists of Manitoba (AOTM)
Manitoba Society of Occupational Therapists
1114-425 Elgin Avenue, Winnipeg, MB, R3A 1P2
Phone: (204) 957-1214 Fax: (204) 942-7828
E-mail: aotm@mb.sympatico.ca

Association of Physiotherapists of Manitoba (APM)
Room 209, 675 Pembina Hwy, Winnipeg, MB, R3M 2L6
Phone: (204) 287-8502 Fax: (204) 474-2506
E-mail: apm@mb.sympatico.ca

Manitoba Chiropractors Association (MCA)
2706-83 Garry Street, Winnipeg, MB, R3C 4J9
Phone: (204) 942-3000 Fax: (204) 942-3010
E-mail: mca@escape.ca

Manitoba Medical Association (MMA)
Canadian Medical Association - Manitoba Division
125 Sherbrook Street, Winnipeg, MB, R3C 2B5
Phone: (204) 985-5888 Fax: (204) 985-5844
E-mail: general@mma.mb.ca

Manitoba Association of Registered Nurses (MARN)
647 Broadway Avenue, Winnipeg, MB, R3C 0X2
Phone: (204) 774-3477 Fax: (204) 775-6052
E-mail: marn@marn.mb.ca

Manitoba Occupational Health Nurse Interest Group (MOHNIG)
c/o MARN, 647 Broadway Avenue, Winnipeg, MB, R3C 0X2

8.2 REFERENCES

General Ergonomics

Eastman Kodak Company, Human Factors Section. *Ergonomic Design for People at Work.* New York: Van Nostrand Reinhold,Vols. 1 and 2, 1986.
Volume 1: A guideline for workplace and equipment design; techniques for improving work performance and productivity; methods for reducing potential job discomfort; and techniques for job evaluation with approaches for improvement of job conditions.
Volume 2: Guidelines and procedures based on ergonomic approaches to provide practical information for the design of jobs and work tasks.

Grandjean, Etienne. *Fitting the Task to the Man - A textbook of Occupational Ergonomics. 4th edition*, Philadelphia: Taylor and Francis, 1988.
Emphasis is placed on the factors that affect people at work. This book provides a summary of some important European ergonomics research that has not been available previously in English. The level of treatment is generally introductory.

Grandjean, Etienne. *Ergonomics in Computerized Offices.* Bristo Pennsylvania: Taylor and Francis, 1987.

Murell, K.F.H. *Human Performance in Industry.* New York: Reinhold, 1965.
Discusses ways in which ergonomics can be used to improve the design of work in industry. The coverage ranges from material of an introductory nature to a few topics that are treated in considerable depth.

Osborne, D.J. *Ergonomics at Work.* New York: John Wiley and Sons, 1982.
A general text on ergonomics with an emphasis on the man-machine interface and workplace and information design. It also includes a discussion on ergonomics and safety and reviews the environmental factors of heat, lighting, noise, and vibration as they affect people at work.

The Physiological Basis of Work

Astrand, P.O. and Rodahl, K. *Textbook of Work Physiology. 3rd Edition.* New York: McGraw-Hill, 1986.
An excellent source of physiological information on people at work. Includes chapters on physical work capacity, physical training, the energy cost of activities, temperature regulation and factors that affect human performance.

Evaluation of Job Demands

Chaffin, D. and Andersson, G.B.J. *Occupational Biomechanics. 2nd Edition.* New York, NY: Wiley, 1991.
This book is an excellent reference guide to design of work practices, tools and workplaces for optimal productivity and safety.

Tichauer, E.R. *The Biomechanical Basis of Ergonomics.* New York: Wiley Interscience, 1978.
A summary of the principles of biomechanics as applied to industrial jobs, especially in manual materials handling and workplace and equipment design.

Patterns of Work

Fitts, P.M. and Posner, M.L. *Human Performance.* Belmont, California: Wadsworth Publishing Company, 1986.
Provides a comprehensive basic review of several aspects of human performance. Among these are learning and skilled performance, motivation, sensory capacities and perceptual processing, skills measurement, and perceptual motor and language skills.

Hours of Work

Colquhoun, W.P. and Rutenfranz, J. eds. *Studies of Shiftwork.* London: Taylor & Francis, 1980.
A compilation of many of the classic papers on shift work, including sections on: biological adaptation to shift work; individual and environmental factors in adjusting to shift work; effects on performance efficiency, family life, health, and well-being; the design of shift systems; and the economics of shift work and methods of compensation. An excellent source of primary references about the existing research on human tolerance of, and performance on, shift work.

Cumulative Trauma Disorders/Repetitive Strain Injuries

Putz-Anderson, Vern, ed. *Cumulative Trauma Disorders: A Manual for Musculoskeletal Diseases of the Upper Limbs.* Philadelphia: Taylor & Francis, 1988.
An overview of cumulative trauma disorders of the upper limb associated with hand-intensive jobs. Includes potential causes, signs/symptoms of trauma, and methods for ergonomic intervention to reduce these problems in the workplace.

Manual Materials Handling

National Institute for Occupational Safety and Health. *Work Practices Guide for Manual Lifting.* DHHS (NIOSH) Publication No. 81-122. Department of Health and Human Services, National Institute for Occupational Safety and Health. Washington, D.C.: U.S. Government Printing Office, 1978.
A guide for designing manual lifting tasks so they are within the capacities of more people. It was developed by a special task force and reviews the epidemiological, biomechanical, physiological, and psychophysical evidence for properly designed lifting tasks.

U.S. Department of Health and Human Services. *Applications Manual for the Revised NIOSH Lifting Equation.* National Technical Information Services, National Institute for Occupational Safety and Health DHHS (NIOSH) Pub. No. 94-10, Cincinnati, OH. 1991.
Provides users with methods for applying the revised NIOSH lifting equation to a variety of lifting tasks, including single and multi-task lifting jobs.

8.3 INTERNET

Manitoba Labour, Workplace Safety and Health Branch
www.gov.mb.ca/labour/safety

Workers Compensation Board of Manitoba
www.wcb.mb.ca

Canadian Centre for Occupational Health and Safety
www.ccohs.ca

National Institute for Occupational Safety and Health (NIOSH; U.S.) – Ergonomics Home Page
www.cdc.gov/niosh/ergopage.html

Occupational Safety and Health Administration (OSHA; U.S.) – Ergonomics Home Page
www.osha-slc.gov/SLTC/ergonomics/index.html

Ergonomics and Safety Associations

Association of Canadian Ergonomists (ACE)
www.hfac-ace.ca

Association for Canadian Registered Safety Professionals (ACRSP)
www.acrsp.ca

International Ergonomics Association (IEA)
www.ergonomics-iea.org

Human Factors and Ergonomics Society
www.hfes.org

The Ergonomics Society (of the United Kingdom)
www.ergonomics.org.uk

American Conference of Governmental Industrial Hygienists, Inc. (ACGIH)
www.acgih.org

Institute of Industrial Engineers
www.iienet.org

8.4 GLOSSARY OF TERMS

Arthritis: Inflammation of a joint or joints.

Awkward posture: Deviation from the ideal working posture of elbows at the side of the torso, with the wrists neutral. Awkward postures typically include reaching behind, twisting forward or backward bending, pinching, and squatting.

Carpal tunnel syndrome: A compression of the median nerve as it passes through the carpal tunnel in the heel of the hand.

Chronic low back pain: General soreness and fatigue of the low back; pain is usually constant, and it accompanies most activities.

Constriction: Binding, squeezing, or shrinking blood vessels so that circulation is reduced.

Cubital tunnel syndrome: Compression of the ulnar nerve as it passes through the notch of the elbow.

Cumulative trauma disorder: Damage to body tissue by outside forces that has built up over time.

Degenerative disc disease: A breakdown of the discs that separate the vertebrae of the spine.

DeQuervain's Disease: An inflammation of the tendon and/or its sheath at the base of the thumb.

Digital neuritis: Compression of the nerves along the sides of the fingers or thumbs.

Engineering controls: A method of controlling worker exposure to risk factors by redesigning equipment, tools, and work stations. Engineering controls are part of hazard prevention and control.

Epicondylitis: An inflammation of the tendons at the elbow. Also called tennis elbow (lateral or outside part of the elbow), or golfer's elbow (medial or inside part of the elbow).

Ergonomics: The scientific study of human work. The term comes from the Greek words "ergos" meaning work, and "nomos," meaning natural laws of. Ergonomics considers the physical and mental capabilities and limits of the worker as he or she interacts with tools, equipment, work methods, tasks, and the working environment.

Ergonomics program: A systematic method (similar to an accident prevention or quality improvement program) used to evaluate, prevent and manage work-related musculoskeletal disorders. The four elements of a typical ergonomics program are worksite analysis, hazard prevention and control, medical management, and training and education.

Ergonomics team: Those responsible for the identifying and correcting of musculoskeletal hazards in the workplace ergonomics program.

Fatigue: A condition that results when the body cannot provide enough energy for the muscles to perform a task.

Forcefulness: The amount of physical effort a person uses to do a task.

Ganglionic cyst: Swelling of the tendon and sheath due to the build-up of synovial fluid inside the sheath. The cyst usually causes a bump under the skin.

Hand-arm vibration: Vibration (generally from a hand tool) that goes through the hand, then travels through the rest of the body.

Hazard prevention and control: Eliminating or minimizing the hazards identified in the worksite analysis. It is changing the jobs, workstations, tools or environment to fit the worker. Hazard prevention and control is an element of the ergonomics program.

Incidence rate: The rate at which new injuries and illnesses occur for a given job, production line, work area, department or the company.

Mechanical contact stress: The contact of the body with a hard surface or edge that results in the compression of tissue. Can also result when using a part of the body as a hammer or striking instrument.

Medical management: The effective use of available health-care resources to prevent or manage work-related musculoskeletal disorders. Medical management is an element of the ergonomics program.

Musculoskeletal disorders: Illnesses and injuries that affect one or more parts of the musculoskeletal system.

Musculoskeletal system: The soft tissue and bones in the body. The parts of the musculoskeletal system are bones, muscles, tendons, ligaments, cartilage, nerves, and blood vessels.

Neutral posture: Comfortable working posture that reduces the risk of musculoskeletal disorders. The joints are naturally aligned with elbows at the side of the body and wrists straight.

Personal protective equipment (PPE): Gloves, kneepads and other equipment that may help reduce hazards until other controls can be implemented, or to supplement existing controls.

Raynaud's Phenomenon: A constriction of the blood vessels in the hands and fingers. Also called "white finger."

Records review: Reviewing company records to identify patterns of injuries (or potential injuries) to help you find the jobs and workstations that may contain musculoskeletal hazards.

Repetitiveness: Performing the same motions repeatedly. The severity of risk depends on the frequency of repetition, speed of the movement or action, the number of muscle groups involved, and the required force.

Risk factors: An aspect of a job that increases the worker's chance of getting a work-related musculoskeletal disorder.

Rotator cuff tendinitis: Inflammation of one or more tendons at the shoulder. Also called "Pitcher's Shoulder."

Severity rate: The cost in terms of lost workdays (or dollars) of new injuries and illnesses occurring in a given job, production line, work area, department or company.

Sprain: Overstretching or overexertion of a ligament that results in a tear or rupture of the ligament.

Static loading: Physical effort or posture that is held and requires muscle contraction for more than a short time. As muscles remain contracted, the blood flow to the muscles is reduced. (Also sustained exertions.)

Strain: Overstretching or overexertion of a muscle or tendon.

Tendinitis: Inflammation of the tendon inside the sheath.

Tenosynovitis: Inflammation of the sheath around the tendon.

Thoracic outlet syndrome: Compression of the nerves and blood vessels between the neck and shoulder often associated with prolonged overhead work.

Trigger finger: A common term for tendinitis or tenosynovitis that causes painful locking of the finger(s) while flexing.

Ulnar nerve entrapment: Compression of the ulnar nerve as it passes through the wrist, often associated with prolonged flexion and extension of the wrist and pressure on the palm.

Work practice controls: Procedures for safe and proper work that are used to reduce the duration, frequency or severity of exposure to a hazard. They include work methods training, job rotation, and gradual introduction to work. Work practice controls are part of hazard prevention and control.

Worksite analysis: A safety and health review that addresses work-related musculoskeletal disorders. It is a structured way of identifying jobs and workstations that may contain musculoskeletal hazards, the risk factors that pose the hazards, and the causes of the risk factors. Worksite analysis is an element of the ergonomics program.

APPENDIX A

SYMPTOMS SURVEY

ID # _____

SYMPTOMS SURVEY

Please answer all questions truthfully and to the best of your ability.

1. Date: _____ / _____ / _____ (Month / Day / Year) 2. Name: _____ (Optional)
3. Job Title: _____
4. Department: _____ 5. Shift: _____
6. Describe the type of work you perform in this job and the amount of time each day spent on these activities.

   Tasks: _____ Time: _____

   _____ _____

   _____ _____

Personal Information

7. Height: _____ feet and inches, or ____ cm 8. Birth date: _____ (year)
9. Gender: ❒ female ❒ male
10. Which hand is your dominant hand? (please check one): ❒ left ❒ right ❒ either
11. How long have you worked in your **current** position?
    - ❒ Less than 3 month
    - ❒ 3 months to 1 year
    - ❒ 1 year to 5 years
    - ❒ 5 years to 10 years
    - ❒ Greater than 10 years
12. How often are you **mentally** exhausted after work?
    - ❒ Never
    - ❒ Occasionally
    - ❒ Often
    - ❒ Always
13. How often are you **physically** exhausted after work?
    - ❒ Never
    - ❒ Occasionally
    - ❒ Often
    - ❒ Always
14. Have you ever had any pain or discomfort during the last year that you believe is related to your work?
    ❒ Yes ❒ No (if **NO**, ***stop here***)
15. If **YES**, for each body part described in the boxes on the reverse side of this page, please indicate:
    - ➢ How often you have discomfort in each body part
    - ➢ The severity of discomfort
    - ➢ Whether the pain interferes with your ability to do your job
    - ➢ On which side of the body the discomfort is felt

For each area with 'Pain' or 'Severe Pain', or in which 'Discomfort' is felt 'Always', please indicate what you think may have caused the problem, and check either 'yes' or 'no', to indicate whether you have suffered a previous injury to this body part.

BODY PART	PREVIOUS INJURY	POSSIBLE CAUSE OF PROBLEM
	❒ Yes ❒ No	
	❒ Yes ❒ No	
	❒ Yes ❒ No	
	❒ Yes ❒ No	
	❒ Yes ❒ No	

ID # _____

PHYSICAL DISCOMFORT SURVEY

Please note: 'pain' may include may include aches, stiffness, numbness, tingling or burning sensations

NECK

How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain

SHOULDERS ❒ right ❒ left

How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain

ELBOWS ❒ right ❒ left

How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain

UPPER BACK

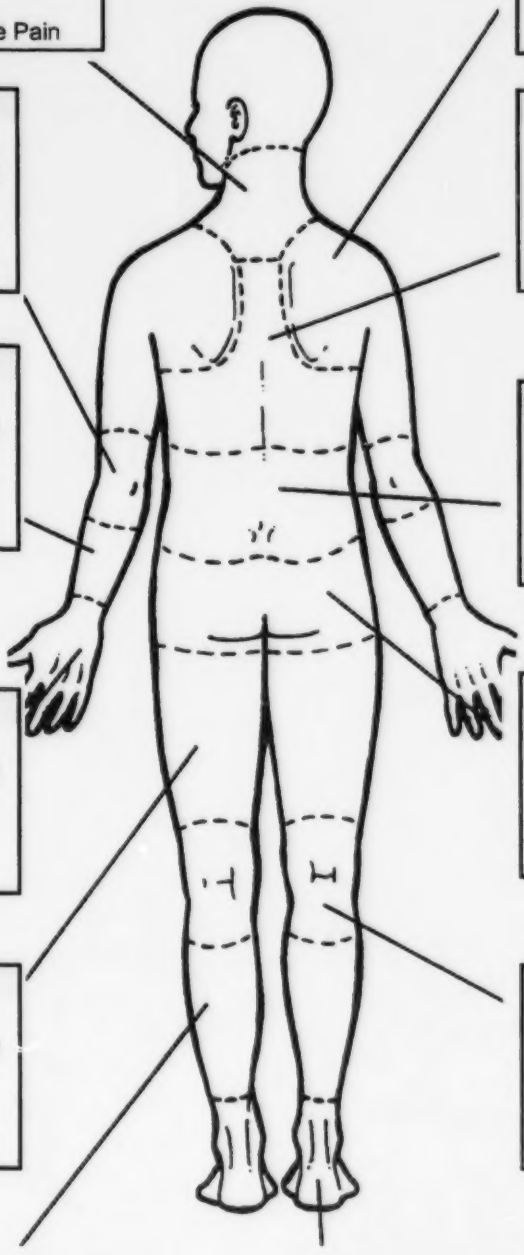
How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain

FOREARMS ❒ right ❒ left

How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain

LOWER BACK ❒ right ❒ left

How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain



WRISTS/ HANDS ❒ right ❒ left

How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain

HIPS ❒ right ❒ left

How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain

THIGHS ❒ right ❒ left

How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain

KNEES ❒ right ❒ left

How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain

LOWER LEGS ❒ right ❒ left

How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain

ANKLES / FEET ❒ right ❒ left

How often?	How Much?
❒ Never	❒ No Discomfort
❒ Occasionally	❒ Discomfort
❒ Often	❒ Pain
❒ Always	❒ Severe Pain

User's Guide to Filling in the Symptoms Survey

Question 1, 'Date', refers to the date that the symptoms survey was completed. The survey should be conducted annually or following any modifications made to the job, equipment, job process or department. This will help to detect any major changes in the frequency and/or location of reported symptoms, as well as provide insight into whether modifications were successful in reducing work-related hazards.

Note that question 2, the worker's name, is not required. This information is unnecessary because results from the symptoms survey are not to be used to examine specific individual's problems, but to determine whether certain jobs or job practices are affecting workers' physical health.

Questions 3, 4 and 6 of the survey are used for job and department identification within the company, and provide space for a description of duties associated with the job title. By grouping surveys from workers within a certain department or job you can prioritize areas of concern and determine the jobs that are affecting workers' health. The description of job tasks may also assist you to determine specific work practices that are resulting in pain or discomfort. Question 5, 'Shift', is an additional method of categorizing the surveys. For example, if only workers on the night shift are experiencing symptoms, there may be a variation in work methods between the two shifts that is leading to problems.

Personal information regarding worker characteristics is included in questions 7 through 11. Results from these questions may reveal trends in worker height, age, gender, hand dominance or work experience that may be related to the development of symptoms because of their interaction with work factors. Questions 12 and 13 provide an indication as to whether workers feel the jobs they are performing are mentally or physically exhausting.

Question 14 asks the worker whether he or she has ever experienced any work-related pain or discomfort in the previous year. If the answer is 'No' the symptom survey is complete. If the answer is 'Yes' the worker then goes on to complete question 15, which includes the second page of the survey (the 'Physical Discomfort Survey'). Workers should first complete the 'Physical Discomfort Survey', ensuring that (for each body part) they indicate the side of the body on which the pain/discomfort is felt, how often it is felt, and how much pain or discomfort they are experiencing.

Once all body parts have been completed in Physical Discomfort Survey, the table at the bottom of page 1 should be filled in for all areas with 'pain' or 'severe pain', or in which 'discomfort' is felt 'always'. This table is important, as workers are providing their thoughts as to the cause of the problem, as well as whether they have had a previous injury in this area. If there has been previous injury to a specific body part this may be an indication that the job did not lead to the pain or discomfort felt by the worker. However, the job may be causing the injury to get worse and should still be examined.

APPENDIX B

ERGONOMIC ANALYSIS WORKSHEET

ERGONOMIC ANALYSIS WORKSHEET

Date: _____ **Analyst:** _____
Job: _____ **Department:** _____
Shift: _____

JOB DESCRIPTION

(Provide a sequential list of tasks performed to conduct this job and the approximate time for completion of each task)

TASK	TIME
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

Overall time for completion of the job? _____
Is the job machine paced? ❒ Yes ❒ No
Provide production info (i.e. rates/quotas)
_____

SCHEDULING

Is there a repeating cycle in this job?
❒ Yes ❒ No
If 'yes', how long is this cycle? _____

Number of cycles per shift? _____

Does the worker alter shifts?
❒ Yes ❒ No
If 'yes', what is the shift schedule?
_____

Breaks: Number? _____
Duration of each? _____
Schedule? (i.e. 2hrs into shift, 4 hr & 6.5 hr)
_____

Does worker rotate to other jobs?
❒ Yes ❒ No
If 'yes', provide job rotation schedule:
_____
_____

TOOLS/MATERIALS

Types of materials/tools handled? _____
_____
_____

Average weight of tools? _____
Maximum weight of object handled?
_____

WORKER INTERVIEW:

DIAGRAM OF WORKSTATION:
(Include measured heights/distances where applicable)

COMMENTS:

APPENDIX C

PHYSICAL DEMANDS DESCRIPTION

Date			Analyst							
Department			Job Title							Shift
PHYSICAL DEMANDS			Not Component	* FREQUENCY				LOAD (object/tool)		COMMENTS
				Seldom	Minor	Required	Major	Maximum (Kg)	Usual (Kg)	
STRENGTH	Lifting									
	Carrying									
	Pushing									
	Pulling									
	Handling									
	Throwing									
	Gripping	Power Grasp								
		Pinch Grasp								
	Reaching	Above Shoulder								
		Below Shoulder								
		to the Side								
POSTURES	Shoulder	Abduction								
		Flexion								
	Hip	Abduction								
	Wrist	Flexion / Extension								
		Radial / Ulnar Devn								
		Pronate / Supinate								
	Trunk	Flexion								
		Extension								
		Side Bend								
		Twist								
	Neck	Flexion								
		Extension								
		Side Bend								
		Twist								
MOBILITY	Sitting									
	Standing									
	Walking									
	Climbing									
	Crawling									
	Crouching									
	Kneeling									
	Balancing									
	Foot Action	One Foot								
		Feet								
	Fine Finger Movements									

* FREQUENCY

SELDOM = Not always performed during completion of job
MINOR = Performed less than 25% of job
REQUIRED = Frequent Repetition for 25%-50% of job
MAJOR = Frequent Repetition for more than 50% of job

	PHYSICAL DEMANDS		Not Component	* FREQUENCY				COMMENTS
				Seldom	Minor	Required	Major	
SENSORY/PERCEPTUAL	Hearing	Conversations						
		Other Sounds						
	Vision	Far						
		Near						
		Colour						
		Depth						
	Perception	Spatial - organisation						
		Form - recognition						
	Feeling							
	Reading							
	Writing							
	Keying/Typing							
	Speech							
WORK ENVIRONMENT	Outside Work							
	Hot							
	Cold							
	Humid							
	Dry							
	Dust							
	Vapour Fumes							
	Noise							
	Vibration	Whole Body						
		Upper Extremity						
	Contact Stress							
	Striking with Hand/Fist							
	Moving Objects							
	Hazardous Machines							
	Electrical							
	Sharp Tools etc.							
	Radiant/Thermal Energy							
	Slippery							
	Congested Worksite							
	Chemical Irritants							
CONDITIONS	Work Independent but in Group							
	Operate Equipment/Machinery							
	Machine Paced							
	Production Quotas							
	Deadline Pressures							
	Irregular/Extended Hours							

* FREQUENCY

SELDOM = Not always performed during completion of job
MINOR = Performed less than 25% of job
REQUIRED = Frequent Repetition for 25% -50% of job
MAJOR = Frequent Repetition for more than 50% of job

User's Guide to Filling in the Physical Demands Description (PDD)

The PDD should be filled out while observing the worker performing his or her job. To get an idea of what the job entails prior to starting the form, you may want to just observe the worker for a short while without trying to check off any of the job components. Try to interrupt the worker as little as possible during completion of the form to ensure that the worker's movements and timing for completion of tasks are characteristic of normal job procedures. You should be able to complete all of the components under the 'Physical Demands' heading (except 'Work Conditions') through direct observation of the worker performing the task. To determine whether workers are required to meet 'Production Quotas', are exposed to 'Deadline Pressures', or must work 'Irregular or Extended Hours', you will need to ask this of the workers themselves.

The PDD begins with an area to record the date the analysis is taking place, the analyst's name, and job descriptors to document which job is being assessed. You will then note the headings 'Physical Demands', 'Frequency', 'Load' and 'Comments'. If you are unsure what is meant by some of the physical demands descriptors, a list of definitions is provided on an accompanying sheet called *Physical Demands Definitions* in this appendix.

To complete the PDD, first determine whether the physical demands that are listed are components of the job or not. If a physical demand (i.e. lifting) is never performed during completion of the job then the column 'Not Component' should be marked. It is important to check off this column, otherwise you may not be sure when you go back to the form later that you have assessed this demand. If you observe that a physical demand is performed during completion of the job, your next step is to determine the 'Frequency' of its performance, or how often it is performed during the job. If you watch the worker complete the job a number of times, and sometimes he or she performs an action (i.e. lifting a box of parts onto the workbench), while other times the action isn't required during the job cycle, you would then mark that the frequency of lifting is 'Seldom'. If a physical demand were performed for less than 25% of the job, the frequency would be 'Minor'. If it were performed for 25%-50% of the job you would mark 'Required', and if the worker needed to perform the physical demand for more than 50% of the job, you should mark it as 'Major'. Note that you do not need to fill out the form in order, as long as all of the physical demands are examined.

As you are marking the frequency of performance of each physical demand, you should add notes in the 'Comments' column of the form to remind yourself as to what the worker was doing or moving or holding that made you say that the physical demand was a component of the job. For example, if you mark off that the job required lifting, write into the comments section the type of things that he or she was lifting. Or, if you mark off that the worker must do minor walking, write in where they are walking or why they are walking, for example, "to retrieve parts from storage".

You will note that for the 'Strength' physical demands there are two columns in which to write the 'Maximum' and 'Usual' Load the worker is handling when performing these actions. In the 'Maximum' column you should write the amount (in Kg) of the heaviest load that the worker must lift, carry, pull, hold in the hand when reaching, etc. In the 'Usual' column, write in the amount that the worker is normally holding, lifting, etc. For example, if the worker lifts parts that weigh approximately 5 Kg ten times, but lifts a box weighing 20 Kg twice, put 5 Kg into the column.

PHYSICAL DEMANDS DEFINITIONS

1. ***Lifting:*** Raising or lowering an object from one level to another (includes upward pulling and/or exerting upward force to hold an object in static position).
2. ***Carrying:*** Transporting an object more than 3 steps, usually holding in the hands, arms, or on the shoulder.
3. ***Pushing:*** Exerting force upon an object so that the object moves away from the force (including exerting force to hold an object in static position).
4. ***Pulling:*** Exerting force upon an object so that the object moves toward the force (including jerking and exerting force to hold an object in static position).
5. ***Handling:*** Seizing or grasping, holding, turning or otherwise working with the hands. Fingers are only involved to the extent that they are extensions of the hand. It is incorrect to assume that the weight of the object held is the same as the handling force.
6. ***Reaching:*** Extending hands and arms in any direction from the neutral postures of the arm. Does not involve the maintenance of a static posture, but rather retrieval of an object or tool.
7. ***Shoulder Abduction/Flexion:*** Not to be confused with 'reaching' above/below shoulder or to the side. Abducted or flexed shoulder *postures* refer to static positions that are maintained during performance of the job.
8. ***Sitting:*** Remaining in a seated position.
9. ***Standing:*** Remaining on one's feet in an upright position without moving greater than 3 steps.
10. ***Walking:*** Moving about on foot greater than 3 steps.
11. ***Climbing:*** Ascending or descending ladders, stairs, scaffolding, ramps, poles and the like, using feet and legs or hands and arms.
12. ***Crouching:*** Bending the body forward and downward by bending legs and spine.
13. ***Kneeling:*** Bending one or both legs at knees to come to rest on knees.
14. ***Balancing:*** Maintaining body equilibrium to prevent falling when walking, standing, crouching or running on either elevated and unguarded, narrow, slippery, sloped or erratically moving surfaces. Balancing is more than the ability to stand or walk. Positions where the worker is close to moving parts on raised platforms or walkways are usually conditions that utilise balance.
15. ***Stooping:*** Bending the body forward and downward by bending (greater than 15 degrees) spine at waist, requiring full use of lower extremities and back muscles.
16. ***Crawling:*** Moving about on the hands and knees.
17. ***Fine Finger Movements:*** Picking, pinching, or otherwise working with the fingers, other than with the whole hand or arm as in handling.
18. ***Hearing:*** Perceiving the nature of sound by the ear.
19. ***Vision:*** Recognition of the nature of objects by the eye. Characteristics of vision include:
    - ➢ Near: refers to distances closer than 20 inches.
    - ➢ Far: considers distances greater than 20 feet.
    - ➢ Depth: is a dimensional vision. Ability to judge distances and spatial relationships so as to see objects where and as they actually are.
    - ➢ Colour: is the ability to identify and distinguish colours.
    - ➢ Field: is peripheral vision (includes vertical and horizontal).
    - ➢ Accomodation: is the requirement to change focus from objects that are far to near during the work cycle.
20. ***Perception:*** Requires cognition or understanding beyond that of visual input. Types of perception include:

- ➢ Spatial: perceiving the organisation or layout of objects, tools, materials, etc.
- ➢ Form: refers to object recognition or differentiation between similar materials.

21. ***Feeling:*** Perceiving attributes of objects, such as size, shape, temperature, or texture by touching with skin, particularly that of fingertips.
22. ***Speech:*** Expressing or exchanging ideas by means of the spoken word to impart oral information to others and to convey detailed instruction to others accurately, loudly or quickly.

APPENDIX D

ERGONOMIC RISK FACTOR CHECKLIST

Erratum

Ergonomics
A Guide to Program Development and Implementation
Version 1.0 November 1999

Respecting **APPENDIX D**
ERGONOMICS RISK FACTOR CHECKLIST

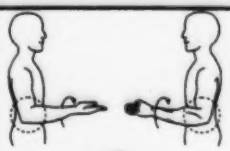
Please note that the attached pages have the risk factors of the second column numbered. The numbers are absent from the original copy.

ERGONOMIC RISK FACTOR CHECKLIST

UPPER EXTREMITY RISK FACTOR CHECKLIST

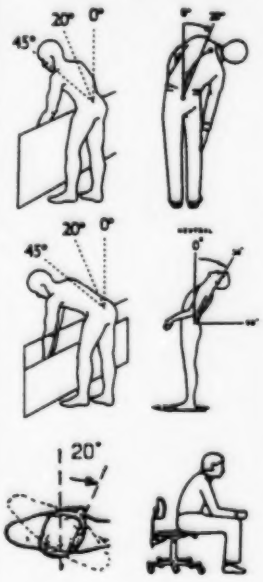
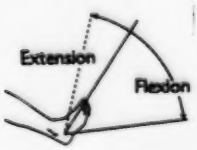
Date: _____ Analyst: _____ Job: _____ Location: _____

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of total job time	25% to 50% of time	50% to 100% of time	If total time for job is >8hrs, add 0.5 per hour	
Upper Limb Movements	**1.** Moderate: Steady motion with regular pauses	☐ YES ☐ NO	0	1	2		
	2. Intensive: Rapid steady motion without regular pauses	☐ YES ☐ NO	1	2	3		
Keyboard Use	**3.** Intermittent Keying	☐ YES ☐ NO	0	0	1		
	4. Intensive Keying	☐ YES ☐ NO	0	1	3		
Hand Force (Repetitive or Static)	**5.** Squeezing Hard with the Hand in a Power Grip	☐ YES ☐ NO	0	1	3		
	6. Pinch More than 2 pounds	☐ YES ☐ NO	1	2	3		
Awkward Postures	**7.** Neck: Twist/Bend (twisting neck >20°, bending neck forward >20° or back < 5°)	☐ YES ☐ NO	0	1	2		
	8. Shoulder: Unsupported arm or elbow above mid-torso height	☐ YES ☐ NO	1	2	3		

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of job time	25% to 50% of time	50% to 100% of time	If job time is >8hrs, add 0.5 per hour	
	9. Rapid Forearm Rotation	☐ YES ☐ NO	0	1	2		
	10. Wrist: Bend or Deviate	☐ YES ☐ NO	1	2	3		
Contact Stress	11. Hard/Sharp objects Press into Skin	☐ YES ☐ NO	0	1	2		
	12. Using the Palm of the Hand or Wrist as a Hammer	☐ YES ☐ NO	1	2	3		
Vibration	13. Localized Vibration (without dampening)	☐ YES ☐ NO	0	1	2		
	14. Whole-body Vibration (without dampening)	☐ YES ☐ NO	0	1	2		
Environment	15. Lighting (poor illumination or glare)	☐ YES ☐ NO	0	0	1		
	16. Adverse Temperatures	☐ YES ☐ NO	0	0	1		
Control Over Work Pace	17. One control factor present = 1 Two or more control factors present = 2	☐ YES ☐ NO					
TOTAL UPPER EXTREMITY SCORE							

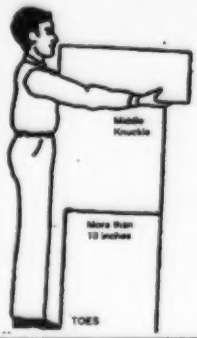
BACK AND LOWER EXTREMITY RISK FACTOR CHECKLIST

Date: _____ Analyst: _____ Job: _____ Location: _____

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of job time	25% to 50% of time	50% to 100% of time	If job time is >8hrs, add 0.5 per hour	
Awkward Postures 	**18.** Mild Forward or Side Bending of Torso More than 20° but Less than 45°	☐ YES ☐ NO	0	1	2		
	19. Severe Forward Bending of Torso More than 45°	☐ YES ☐ NO	1	2	3		
	20. Backward Bending of Torso	☐ YES ☐ NO	0	1	2		
	21. Twisting of Torso	☐ YES ☐ NO	1	2	3		
	22. Prolonged Sitting Without Adequate Back Support	☐ YES ☐ NO	0	1	2		
	23. Standing Stationary or Inadequate Foot Support While Seated	☐ YES ☐ NO	0	0	1		
	24. Foot action (pedal), Standing Stationary with Inadequate Foot Support, Balancing	☐ YES ☐ NO	0	1	2		
	25. Kneeling/ Squatting	☐ YES ☐ NO	1	2	3		
	**26.** Hip Abduction (Repetitive/ Prolonged)	☐ YES ☐ NO	0	1	2		
	27. Repetitive Ankle Extension/ Flexion	☐ YES ☐ NO	0	1	2		

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of job time	25% to 50% of time	50% to 100% of time	If job time is >8hrs, add 0.5 per hour	
Contact Stress	**28.**Hard/Sharp objects Press into Skin	☐ YES ☐ NO	0	1	2		
	29. Using the Knee as a Hammer or Kicker	☐ YES ☐ NO	1	2	3		
Vibration	**30.**Whole-Body Vibration (without dampening)	☐ YES ☐ NO	0	1	2		
Push/Pull	**31.** Moderate Load	☐ YES ☐ NO	0	1	2		
	32. Heavy Load	☐ YES ☐ NO	1	2	3		
Control Over Work Pace	**33.** One control factor present = 1 Two or more control factors present = 2	☐ YES ☐ NO					
MANUAL HANDLING CHECKLIST SCORE (Add scores 2 & 3 from page 3 and insert total here)							
TOTAL BACK AND LOWER EXTREMITY SCORE							

MANUAL HANDLING CHECKLIST

34(a). STEP I:	NEAR LIFT	MIDDLE LIFT	FAR LIFT
Determine If the Lift is Near, Middle, or Far (Body to Hands) - Use an average horizontal distance if a lift is made every 10 minutes or less. - Use the largest horizontal distance if more than 10 minutes pass between lifts.			

34(b). STEP II:	NEAR LIFT		MIDDLE LIFT		FAR LIFT	
Estimate the Weight Lifted (Pounds) - Use an average weight if a lift is made every 10 minutes or less. - Use the heaviest weight if more than 10 min. pass between lifts. - Enter 0 in the total score if the weight is 10 lb or less.	**DANGER ZONE**	More than 51 lb 5* points	**DANGER ZONE**	More than 35 lb 6 points	**DANGER ZONE**	More than 28 lb 6 points
	CAUTION ZONE	17 to 51 lb 3 points	**CAUTION ZONE**	12 to 35 lb 3 points	**CAUTION ZONE**	10 to 28 lb 3 points
	SAFE ZONE	Less than 17 lb 0 points	**SAFE ZONE**	Less than 12 lb 0 points	**SAFE ZONE**	Less than 10 lb 0 points

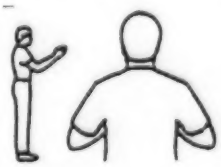
*If lifts are performed more than 15 times per shift, use 6 points. **STEP II SCORE:** _____

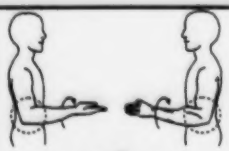
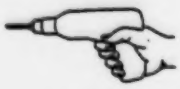
STEP III:	Factor	Occasional lifts (<1 hr/shift)	Frequent lifts (>1 hr/shift)	
Determine the Points for Other Risk Factors - Use occasional lifts if more than 10 minutes pass between lifts - Use the more than 1 hour points if the risk factor occurs with most lifts and lifting is performed for more than 1 hour	**35.** Twist torso during lift	1	1	
	36. Lift one-handed	1	2	
	37. Lift unexpected loads	1	2	
	38. Lift 1-5 times/minute	1	1	
	39. Lift > 5 times/minute	2	3	
	40. Lift above the shoulder	1	2	
	41. Lift below the knuckle	1	2	
	42. Carry objects 10 - 30 feet	1	2	
	43. Carry objects > 30 feet	2	3	
	44. Lift while seated or kneeling	1	2	
		STEP III SCORE:		

ERGONOMIC RISK FACTOR CHECKLIST

UPPER EXTREMITY RISK FACTOR CHECKLIST

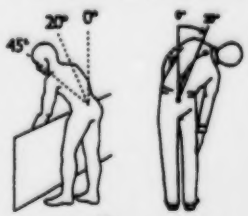
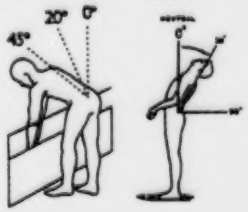
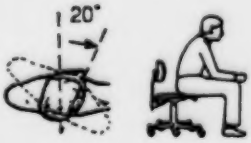
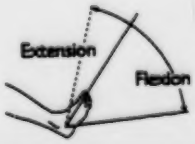
Date: _____ Analyst: _____ Job: _____ Location: _____

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of total job time	25% to 50% of time	50% to 100% of time	If total time for job is >8hrs, add 0.5 per hour	
Upper Limb Movements	Moderate: Steady motion with regular pauses	☐ YES ☐ NO	0	1	2		
	Intensive: Rapid steady motion without regular pauses	☐ YES ☐ NO	1	2	3		
Keyboard Use	Intermittent Keying	☐ YES ☐ NO	0	0	1		
	Intensive Keying	☐ YES ☐ NO	0	1	3		
Hand Force (Repetitive or Static)	Squeezing Hard with the Hand in a Power Grip	☐ YES ☐ NO	0	1	3		
	Pinch More than 2 pounds	☐ YES ☐ NO	1	2	3		
Awkward Postures	Neck: Twist/Bend (twisting neck >20°, bending neck forward >20° or back < 5°)	☐ YES ☐ NO	0	1	2		
	Shoulder: Unsupported arm or elbow above mid-torso height	☐ YES ☐ NO	1	2	3		

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of job time	25% to 50% of time	50% to 100% of time	If job time is >8hrs, add 0.5 per hour	
	Rapid Forearm Rotation	☐ YES ☐ NO	0	1	2		
	Wrist: Bend or Deviate	☐ YES ☐ NO	1	2	3		
Contact Stress	Hard/Sharp objects Press into Skin	☐ YES ☐ NO	0	1	2		
	Using the Palm of the Hand or Wrist as a Hammer	☐ YES ☐ NO	1	2	3		
Vibration 	Localized Vibration (without dampening)	☐ YES ☐ NO	0	1	2		
	Whole-body Vibration (without dampening)	☐ YES ☐ NO	0	1	2		
Environment	Lighting (poor illumination or glare)	☐ YES ☐ NO	0	0	1		
	Adverse Temperatures	☐ YES ☐ NO	0	0	1		
Control Over Work Pace	One control factor present = 1 Two or more control factors present = 2	☐ YES ☐ NO					
TOTAL UPPER EXTREMITY SCORE							

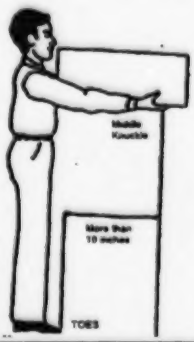
BACK AND LOWER EXTREMITY RISK FACTOR CHECKLIST

Date: _____ Analyst: _____ Job: _____ Location: _____

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of job time	25% to 50% of time	50% to 100% of time	If job time is >8hrs, add 0.5 per hour	
Awkward Postures 	Mild Forward or Side Bending of Torso More than 20° but Less than 45°	☐ YES ☐ NO	0	1	2		
	Severe Forward Bending of Torso More than 45°	☐ YES ☐ NO	1	2	3		
	Backward Bending of Torso	☐ YES ☐ NO	0	1	2		
	Twisting of Torso	☐ YES ☐ NO	1	2	3		
	Prolonged Sitting Without Adequate Back Support	☐ YES ☐ NO	0	1	2		
	Standing Stationary or Inadequate Foot Support While Seated	☐ YES ☐ NO	0	0	1		
	Kneeling/Squatting	☐ YES ☐ NO	1	2	3		
	Repetitive Ankle Extension/Flexion	☐ YES ☐ NO	0	1	2		
Contact Stress	Hard/Sharp objects Press into Skin	☐ YES ☐ NO	0	1	2		
	Using the Knee as a Hammer or Kicker	☐ YES ☐ NO	1	2	3		

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of job time	25% to 50% of time	50% to 100% of time	If job time is >8hrs, add 0.5 per hour	
Vibration	Whole-Body Vibration (without dampening)	☐ YES ☐ NO	0	1	2		
Push/Pull	Moderate Load	☐ YES ☐ NO	0	1	2		
	Heavy Load	☐ YES ☐ NO	1	2	3		
Control Over Work Pace	One control factor present = 1 Two or more control factors present = 2	☐ YES ☐ NO					
MANUAL HANDLING CHECKLIST SCORE **(Add scores 2 & 3 from page 3 and insert total here)**							
TOTAL BACK AND LOWER EXTREMITY SCORE							

MANUAL HANDLING CHECKLIST

STEP I:	NEAR LIFT	MIDDLE LIFT	FAR LIFT
Determine If the Lift is Near, Middle, or Far (Body to Hands) - Use an average horizontal distance if a lift is made every 10 minutes or less. - Use the largest horizontal distance if more than 10 minutes pass between lifts.			

STEP II:	NEAR LIFT		MIDDLE LIFT		FAR LIFT	
Estimate the Weight Lifted (Pounds) - Use an average weight if a lift is made every 10 minutes or less. - Use the heaviest weight if more than 10 min. pass between lifts. - Enter 0 in the total score if the weight is 10 lb or less.	**DANGER ZONE**	More than 51 lb 5* points	**DANGER ZONE**	More than 35 lb 6 points	**DANGER ZONE**	More than 28 lb 6 points
	CAUTION ZONE	17 to 51 lb 3 points	**CAUTION ZONE**	12 to 35 lb 3 points	**CAUTION ZONE**	10 to 28 lb 3 points
	SAFE ZONE	Less than 17 lb 0 points	**SAFE ZONE**	Less than 12 lb 0 points	**SAFE ZONE**	Less than 10 lb 0 points

*If lifts are performed more than 15 times per shift, use 6 points. **STEP II SCORE:** _____

STEP III:	Factor	Occasional lifts (<1 hr/shift)	Frequent lifts (>1 hr/shift)	
Determine the Points for Other Risk Factors - Use occasional lifts if more than 10 minutes pass between lifts - Use the more than 1 hour points if the risk factor occurs with most lifts and lifting is performed for more than 1 hour	Twist torso during lift	1	1	
	Lift one-handed	1	2	
	Lift unexpected loads	1	2	
	Lift 1-5 times/minute	1	1	
	Lift > 5 times/minute	2	3	
	Lift above the shoulder	1	2	
	Lift below the knuckle	1	2	
	Carry objects 10 to 30 feet	1	2	
	Carry objects > 30 feet	2	3	
	Lift while seated or kneeling	1	2	
		STEP III SCORE:		

User's Guide to Filling in the Ergonomic Risk Factor Checklist

The purpose of this booklet is to provide an explanation of the content and use of the Ergonomics Risk Factor (ERF) Checklist. A checklist is only one part of an ergonomics analysis, and works best as a preliminary tool for observing a job and characterizing the levels of risk factors present within a job. A checklist does not provide answers, but instead provides a means of remembering what to analyse and an indication of what factors could be a problem within a job.

The ERF checklist was created to address the situations found within an industrial manufacturing environment. The design of the ERF checklist emphasizes the identification of the combination of risk factors that occur most frequently in industry, and those associated with the highest magnitude of risk. The checklist is divided into three parts: risk factors for the upper extremity, risk factors for the back and lower extremity, and risk factors associated with manual materials handling. Within each of the parts, risk factors are assigned scores that increase with duration of exposure to each risk factor. To utilize the checklist, the analyst (you) must evaluate a work task or job to determine which, if any, risk factors are present and for how long each day the worker is exposed to each risk factor. The assigned scores for each combination of risk factor exposure/duration identified are added separately for the upper limb and the low back. Scoring risk factors for the upper limb and the low back are kept separate because simultaneous exposure to an upper extremity risk factor and a low back risk factor does not generally affect the same joint or anatomic region.

General Instructions

The following is a quick guide on how to perform an analysis using the ERF checklist. All components of the checklist should be filled out for each job or task to ensure that a full analysis has been performed.

STEP 1 - Familiarize Yourself with the Job

The first step in the analysis process is to familiarize yourself with the job. The two key ways to do this is through observation and interview. Stand back and watch the person perform the job for a few minutes; you are trying to get a feel for the range of activities that the person must perform in a day. To ensure that you are seeing everything that the person does, talk with the worker and ask them some questions about their job. Once you have observed the job and interviewed the worker, you should now complete the ***Ergonomics Analysis Worksheet***. You do not have to fill these spaces, and you may need room to add more information later.

Within ***Job Description*** you should try and describe the job on two levels: general and specific. The general description should detail the goals and duties that are involved with this job; this will provided a base for understanding why the person is performing various duties. The specific description should break down a job into the actions that are required to perform it. For instance: pick up part A from bin B and place on table C. These statements describe the general movements of the person and the sequencing of these movements.

The ***Comments*** you make about a job should provide additional, useful pieces of information that do not fit within the structure of the checklist, and may be relevant for further analyses. Within this section, you can make general remarks about the workstation, environment, job, or worker. You may want to include any measurements that you were able to perform (e.g. mass, dimensions, temperature, etc.). You could also include information pertaining to the anthropometrics (body, size and type) of the person, and how well this matches with the workstation. Upon completion of the risk factor analyses (Steps2-4), you could also comment on which parts of the task tended to contain which risk factors (i.e. was there any specific task that was causing trouble?)

The goal of an ergonomic analysis is to ensure that the job fits the worker. Therefore, the input on the person performing the job is a key part of the analysis. To fill out the ***Worker Interview*** portion of the checklist, you must talk with the person and gain their insight into the daily workings of the job. Some questions that could provide some useful information are:

Could you explain what you do for me?
Is this what you do all day, or do your duties change at any time?
If you could improve this job in any way, what would you change?
Do you feel any aches, pains, etc., that you feel are related to your job?
If YES, what parts of your job are a problem to you?

STEP 2 – Determine What Risk Factors are Present

The next step within the checklist analysis is to determine what risk factors the person is being exposed to over the course of a day. If you look at these pages, you will note that the checklist is divided into columns; you will be filling out the column with the title ***Exposure***. The exposure column contains simple yes/no questions, requiring you to answer whether or not the person is being exposed to the various risk factors described in each row. REMEMBER, you should have read and understood the risk factor definitions before you attempt to perform this step in the analysis, or any further ones.

You should look at each risk factor, and observe the job to determine if the person is exposed to this factor at any time. If exposure exists, enter a YES; if the risk factor does not occur within this job, then check off NO. Once you have addressed all of the risk factors, then you can move on to Step 3.

STEP 3 – Determine the Duration of Exposure to the Risk Factors

In Step 2, you determined WHAT the person is being exposed to. Now, you must determine HOW LONG (***Time*** column) the person is exposed to each risk factor. For every risk factor that you recorded a YES for in Step 2, you will now evaluate the length of time that the person is exposed to this factor. The risk factors that were found not present for this job, and were checked NO in Step 2, can be ignored in Step 3.

The duration of exposure you are measuring here is not how long a person does a job, but instead how long the person does what is described as a risk factor. As an example:

> Joe performs a job on a production line that has a cycle time (or job cycle) of 60 seconds; he does this job for 8 hours per day. For 45 seconds of every cycle, Joe works with his wrist deviated. For 20 seconds of every cycle, Joe's elbow is above mid-torso level. For 5 seconds of every cycle, Joe is bent forward greater than 45°. The easiest way to look at this job is to consider the job cycle to be representative of the entire day (i.e. whatever Joe does for 60 seconds, he does for 8 hours). Therefore, if Joe's wrist is deviated for 30 seconds every cycle, then through simple math (45/60 = 0.75), Joe spends ¾ of his day or 6 hours with his wrist deviated. You would then give Joe a score of 3 for wrist deviation. Using the same format, you can calculate that Joe spends approximately 3 hours per day with his elbow above mid-torso level, and less than 1 hour per day with his torso bent forward greater than 45°. These durations of exposure would result in a score of 2 for shoulder posture and a score of 1 for trunk posture.

Regardless of the length of work cycle, the principal is the same for determining duration of exposure. All that you have to remember is that you are measuring how long the person is exposed to the individual risk factor, and this does not always correspond to the actual duration of the job.

Once you have determined the duration of exposure for a risk factor, and have determined the score that corresponds to this exposure, you should then circle this score in the appropriate column and write down this score in the far right column. When you have completed both the Upper Limb and the Back & Lower Extremity Checklists, look over each checklist to ensure that every risk factor that has a YES in the ***Exposure*** column has a score in ***Time*** column. Additionally, every risk factor that was checked NO in the ***Exposure*** column should have no score in the **Time** column. Once you have completed this task, you can now go on to Step 4.

STEP 4 – Evaluation of Manual Materials Handling

The Manual Materials Handling (MMH) checklist is designed to evaluate the risk factors associated with lifting and carrying materials. The MMH checklist focuses on such variables as the location of the item being the lift, the mass of the item, how often the items is lifted, and the posture of the person while handling the item. To perform this analysis, the MMH checklist guides you through 3 distinct steps.

The first step in the analysis is to determine the ***Horizontal Distance*** of the load from the body. The distance is divided into 3 categories: near (0 to 4 inches), middle (4 to 10 inches), and far (more than 10 inches). These ranges refer to the distance from the toes of the person to the middle knuckle.

The second step in the analysis is to estimate the ***Weight*** of the item being lifted. If an item is lifted every 10 minutes or less, then use the average weight of all the items being lifted. If more than 10 minutes pass between lifts, then use the heaviest weight that the person lifts. Once you have established the ***Weight*** of the item, you then combine this information with your

estimate of ***Horizontal Distance*** to determine your score for Step II. For example: a job where a person lifts a 20 lb load at a middle distance from the body (4 to 10 inches) would receive a score of 3 points. If the person does not lift any item that are greater than 10 lbs, then a score of 0 would be given to this job.

The third steps in the MMH analysis is to evaluate the ***Other Risk Factors*** that are related to handling loads. This third step is completely separate from step II; therefore, even if the items being lifted are not above 10 lbs, you should still fill out this section. The procedure for filling out this section is similar to that of the Risk Factor checklists for the Upper Extremity and Back & Lower Extremity. Your first decision is with respect to duration of exposure: how often and how long do the MMH activities occur? If lifting is only occasional, and more than 10 minutes pass between lifts, then you will be choosing values from the first column titled ***Occasional Lifts***. If the risk factor occurs with most lifts, and lifting occurs for more than 1 hour, then you will be using the values from the second column titled ***Frequent Lifts***. Once you have determined which column you will be using, your next task is to review each risk factor and determine whether or not the person is exposed to this factor. If the person is exposed to the factor, then circle the score in the appropriate column and transfer this value to the far right column. Once you have evaluated all of the risk factors, add up the scores in the right hand column and place the total in the box marked STEP III SCORE.

The MMH checklist is really a component of the Back & Lower Extremity checklist. As such, the scores you obtain from the MMH checklist are recorded within the Back & Lower Extremity checklist, and contribute to the total score in this checklist. Once you have completed the MMH checklist, add up your scores from Steps II & III and record this value in the second last row of the Back & Lower Extremity checklist. You are now ready to move on to STEP 5 of the analysis.

STEP 5- Add up the Checklist Scores

The next step in the analysis is to determine the ***Total Scores*** for the Upper Limb and Back & Lower Extremity Checklists. All that is required here is to add up the scores in the far right column for each of the checklists, and record the total at the bottom of each checklist.

STEP 6 – Opportunities for Improvement

The final stage of the analysis is to record any actions that you feel could be performed to improve the job. After observing the job, talking with the worker, and performing the checklist analysis, are there any recommendations that you can make? You could recommend that certain aspect of the job be looked at in more detail before any decisions are made. The size and importance of your ideas are irrelevant; the key here is to record some ideas while you are there and the information is fresh in your head. Do some quick brainstorming, and try not to leave before you have written down at least 2 or 3 ideas. You can record your thoughts in the ***Comments*** section of the EAW.

APPENDIX E

ERGONOMIC RISK FACTOR DEFINITIONS

Risk Factor Definitions

Upper limb movements:

Repetitiveness is performing the same motions repeatedly. The severity of risk depends on the frequency of repetition, speed of the movement or action, the number of muscle groups involved, and the required force. Repetitiveness is influenced by machine or line pacing incentive programs, piece-work and unrealistic deadlines. This risk factor, upper limb movements, is a measure of the amount of time a person spends with their upper limbs moving, as well as the speed of the movements. You should think of this as a 10-point scale of movement where *moderate* falls around the 5-7 mark and *intensive* falls around the 8-10 mark. If you think of the fastest pace you could work, where if you took a break you would fall behind immediately, then that would be intensive movement. The key here is that you are looking at the amount of movement over the entire work cycle. You cannot have intensive movement for 10 seconds, and then take a break. This scale takes breaks into consideration. If you feel the movements are moderate over the entire work cycle then the person is exposed to this risk factor. Therefore, the only two answers you can have are no exposure or exposure for the entire work cycle.

0	2	4	6	8	10
Hands idle most of the time; no regular exertions	Consistent, conspicuous pauses	Slow steady motion; frequent pauses	Steady motion; infrequent pauses	Rapid steady motion; no regular pauses	Rapid steady motion; difficulty keeping up

Hand Force:

A power grip is gripping an object with your hand in the shape of a fist. You are able to use your fingers, thumb and palm to generate the force. A pinch grip involves gripping onto an object using your thumb and any of your fingers. A power grip becomes forceful when either the object being held weighs more than 10 lbs, or (through visual analysis) you note excessive muscular activity in the forearm while gripping the object (i.e. high force movement ... heavy push/pull, etc.). The pinch grip becomes a risk factor when you grip something weighing more than 2 pounds. Poorly fitted gloves reduce dexterity and feeling, resulting in a need to use stronger muscle force; if the worker is wearing gloves, you will add 1 point to the risk factor score.

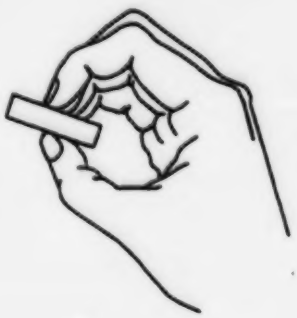


Figure 1: Pinch Grip

Figure 2: Power Grip

Awkward Postures:
An awkward posture refers to a deviation from the ideal working posture, which is one of arms at the side of the torso, elbows bent, with the wrists straight. Awkward postures typically include reaching behind, twisting, working overhead, kneeling, forward or backward bending, and squatting. These are postures that cause the body to produce excessive and unnecessary force to perform a movement. The principal here is that when the muscles and joints are not in an optimal position for force development, then they must increase their level of effort to perform the activity.

You are looking for the following:

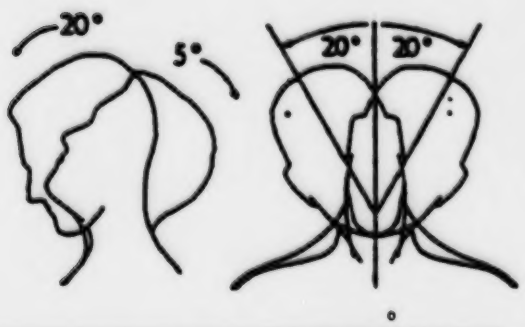


Figure 3: Neck bending/twisting > 20°

Figure 4: Shoulder being flexed such that the elbow is working above mid-torso height

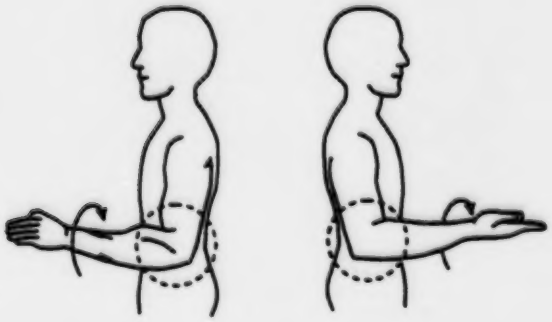


Figure 5: Rapid rotation of the forearm (screwdriving action)

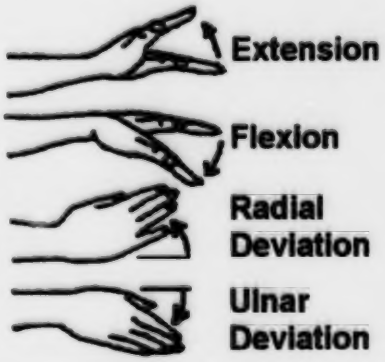


Figure 6: Flexion/extension of the wrist >20° or ulnar/ radial deviation of the wrist

Figure 7: Mild forward bending (20-45°)

Figure 8: Severe bending of the torso (>45°);

Figure 9: Bending to the side

Figure 10: Twisting of the torso > 20° (you are looking for the angle between the shoulders and the hips)

Figure 10: Prolonged sitting without back support

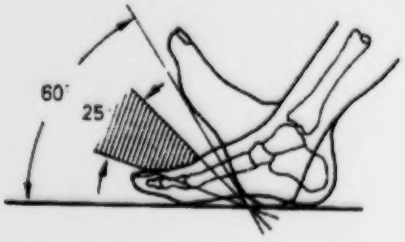
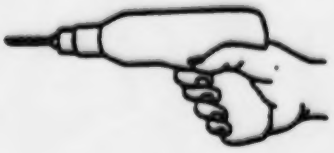


Figure 11: Repetitive ankle extension/flexion

Contact Stress:
Mechanical contact stress refers to contact of the body with a hard surface or edge that results in the pinching or crushing of tissue. Contact stress can also result when using a part of the body as a hammer or striking instrument. You are looking for objects/materials that would press into the skin and in some way deter blood flow or place undue pressure on a nerve, tendon or muscle (i.e. inhibit motion in any way). Using the hand as a striking tool is also a contact stress risk factor.

Vibration:
Hand-arm vibration refers to vibration (generally from equipment or a hand tool) that goes through the hand and arm, then travels through the rest of the body. Vibration can also affect the lower back, especially when driving a vehicle. Vibration reduces blood flow and sensory response. You are looking for either the transfer of vibration into a distinct body area, usually through the hand, or into the entire body by standing or sitting on a vibrating surface. Many tools vibrate during use, and this can transfer into the arm to produce localized vibration.



Environment:
Low temperatures reduce sensory feedback, dexterity, blood flow, muscle strength, and balance. High temperatures increase the rate at which the body fatigues. Lighting levels affect the person's ability to perform the task (e.g. bending forward in order to see product).

Control Over Work Pace:
Control over work pace is a risk factor because it affects the ability of the worker to regulate their speed of work. If a worker starts to feel pain or discomfort, the best method of alleviating this is to stretch and take a break. If the pace of the work is externally controlled, then the worker cannot take a break when needed. Things such as a production line, a conveyer belt, working for piece rate (e.g. tree planting), electronic monitoring, etc., are all examples of control factors. If the person is exposed to one factor, they get a score of 1. If they are exposed to 2 or more factors, they get a score of 2.

Push/Pull:
If you have a device that can measure a push/pull force, then a Moderate push/pull is when the initial force is between 90 and 225 N; a Heavy push/pull is when the initial force required is >225 N. If you cannot measure the force, then you can estimate the force by watching the person work. A Moderate push/pull can be produced with one hand or two, requires little effort from the legs and looks smooth and steady once the object is moving. A Heavy push/pull will require two hands, steady and possibly significant effort from the legs, and the movement will seem very strenuous over the entire course of the push/pull.

Keyboard use:
Any type of keyboard use, including typewriter, computer keyboard, or machine control keys. 'Intermittent' use refers to 50-75% of the day spent on a keyboard. 'Intensive' keyboard use refers to 75-100% of the day spent on a keyboard.

APPENDIX F

WORKPLACE CAPABILITIES FORM

WORKPLACE CAPABILITIES FORM

Dear _____

To aid in the early and successful rehabilitation of ill or injured workers, we are informing health professionals that _____ has modified employment available for employees with an injury/illness. In order to identify appropriate work, we request your assistance in completing the following workplace capabilities form, which will enable us to provide the employee with duties within his/her capabilities and your guidelines. Your cooperation is appreciated.

DATE: _____ EMPLOYEE'S NAME: _____
(Please Print)

(A) Employee may return to work without restrictions on _____
(Day / Month / Year)

(B) Employee is totally disabled. Estimated duration of absence _____ Days _____ Weeks

(C) Employee is partially disabled. He/she may return to modified work with restrictions as indicated below:
1. (please circle or check those that apply)

In an 8 hour workday	Hours at a time	Total hours during day	No Restrictions
patient can **stand**	0-2 2-4 4-6 6-8	0-2 2-4 4-6 6-8	
patient can **walk**	0-2 2-4 4-6 6-8	0-2 2-4 4-6 6-8	
patient can **sit**	0-2 2-4 4-6 6-8	0-2 2-4 4-6 6-8	

2. Employee can **lift/carry**:
(a) Floor to waist: ❑ less than 2 kg ❑ 2 kg to 10 kg ❑ 10 kg to 23 kg ❑ No restrictions
(b) Waist to shoulder: ❑ less than 2 kg ❑ 2 kg to 10 kg ❑ 10 kg to 23 kg ❑ No restrictions

3. Employee is limited in **hand(s) use** for:

	(a) Gripping objects	(b) Pushing/pulling	(c) Fine Finger Manipulation	(d) No restrictions
Right:	❑ Yes ❑ No	❑ Yes ❑ No	❑ Yes ❑ No	❑ Yes ❑ No
Left:	❑ Yes ❑ No	❑ Yes ❑ No	❑ Yes ❑ No	❑ Yes ❑ No

4. In an 8 hour workday, employee is **able to do** the following: (please check column that applies)

Action	No Restriction	Continuous 67% - 100%	Frequent 34% - 66%	Occasional Up to 33%	Not at all
Repetitive hand/wrist:					
Right - flexion/extension					
- rotation					
- radial/ulnar deviation					
Left - flexion/extension					
- rotation					
- radial/ulnar deviation					
Repetitive elbow:					
Right - flexion/extension					
- rotation					
Left - flexion/extension					
- rotation					
Working with hands above shoulders					
Reaching above shoulder level					
Reaching within body envelope					
Reaching outside body envelope					
Bending					
Twisting					
Squatting					
Kneeling					

5. Limit vibration to: ❒ Minimal exposure ❒ No vibration exposure

6. Limit overall physical exertion to: ❒ Mild ❒ Moderate ❒ As tolerated

7. Is employee restricted by environmental factors such as heat/cold, dust, chemical fumes, etc.?
❒ No restrictions
❒ Yes - Please explain _____

8. Is employee involved with treatment and/or medications that might affect his or her ability to work?
❒ No
❒ Yes - Please explain _____

9. Will the employee be required to wear any assistive device or braces?
❒ No
❒ Yes - What type? _____

10. Recommendation for work hours: ❒ Full time hours ❒ Modified hours ❒ Graduated hours

11. At this time, how many hours per day can the employee work?
❒ 2 hours ❒ 4 hours ❒ 6 hours ❒ 8 hours

12. Estimated duration of limitations: _____ (Day/Month/Year)

13. Date of next appointment for review of capabilities: _____ (Day/Month/Year)

14. Additional General Comments/Specific Limitations:

_____

_____

_____

_____

Health Professional's Name: _____ Phone: _____
(Please print)

Signature: _____

Authorization of Employee

I hereby authorize the release of this information to _____ for the sole use in the Return to Work Program

_____ _____
(Date) (Employee's Signature)

APPENDIX G

ENGINEERING CONTROL OPTIONS

ENGINEERING CONTROL OPTIONS

General Tips

- Purchasing specifications should indicate the operations within the plant, the uses of the equipment, and the general performance characteristics required to reduce the risk to health and safety.

- Employers should consider the need for workplaces to be designed to accommodate both right-handed and left-handed workers, ensuring that a worker's dominant hand can be used (i.e. a person can generate more force, work with greater dexterity, and work more comfortably with their dominant hand).

- Worker performance varies between individuals and over time, and can be influenced by work and equipment factors. In determining safe work rates, some of the factors that need to be considered are:

    (a) physical variations between individuals;
    (b) skills, knowledge and experience of workers;
    (c) type of work and equipment;
    (d) introduction of new work and equipment;
    (e) efficiency of the work process;
    (f) duration of working time; and
    (g) standard of work required.

- Many jobs have predictable peak periods which may result in large variations in job demand. The increased risks generated during these peak periods may be prevented by long term planning of resources and organization of tasks.

- Where the job requires a sustained period of repetitive or static (holding or restraining) activity, and it is not possible to provide effective task variation, rest breaks should be provided. The exact length and frequency of such breaks will depend on the nature of the tasks which make up the job.

Because of the importance of engineering controls, we include here a comprehensive list of types and examples. Engineering controls include:

Computer Workstations

Computer workstations have special considerations you should be aware of. (See booklet for further details). Monitor and keyboard positions, lighting and seating are especially important in preventing work-related musculoskeletal disorders and eye discomfort. Shared workstations should be easily adjustable so that the screen and keyboard can be at the optimum level.

Workspace Layout

Workspace layout and arrangement should allow:

- Adjustability to fit each worker's size.

- Worker to maintain neutral posture and avoid awkward or extended reaches and jerky movements while performing the tasks.
- A variety of working positions to avoid static postures.
- Full range of motion and adequate leg room.
- Adequate space for, and access to, all necessary tools and equipment.
- Frequently used work items within arm's reach.
- Unobscured line of sight.
- Neutral posture.

Work Surfaces

Work surfaces should be at the proper height and angle for the individual worker's size and tools and equipment used. They should permit neutral postures and be adjustable, especially where different kinds of tasks are performed or the workstation is shared. For example, where workers inspect or assemble small parts, or perform other visually intensive tasks, work surfaces could be tilted to reduce neck, shoulder and arm strain.

Walking and standing surfaces
Surfaces on which people stand for long periods should be designed to prevent slipping and provide adequate traction and comfort. Anti-fatigue floor mats, sit-stand stools, and footrests can help make workers more comfortable.

Sitting vs. Standing
Wherever a task can be effectively performed from a sitting position, the employer should ensure that seating matched to the individual and task is provided and maintained.

Where the work cannot be performed effectively from a sitting position, but it is possible for workers to sit from time to time while performing the task, the employer should ensure that suitable seats are provided to enable the workers to take advantage of these opportunities.

Posture should be varied between sitting and standing positions where possible to reduce the effects of fatigue from maintaining one position for too long.

The most appropriate working positions should be determined by considering:
- the tasks that are performed;
- the frequency and duration of tasks;
- the materials, equipment and tools used; and
- the individual's ability to adopt a safe body posture.

A seated position is required for:
- accurate control and fine manipulation;
- light manual work (continuous); and
- close visual work with prolonged attention, for example, continuous keyboard work or electronic assembly.

Chairs selected for use in the workplace should meet the following basic requirements:
- be easily adjustable in respect to:
  - seat height,
  - backrest height, and

- backrest angle;
- have appropriate dimensions, for example, seat depth and width;
- have padded seat and backrest; and
- be safe and stable.

Seat-height adjustability and lower back support are important for seated work done for extended periods. Some workers may choose to alternate sitting and standing to reduce stress on the body from working in one position too long.

Chairs or seating should:
- Adequately support the back and legs.
- Have padded seats.
- Have separately adjustable back and seat cushions.
- Permit feet to be supported either on the floor or with a foot rest.
- Be easily adjustable while seated.
- Have swivel seats for most tasks.
- Isolate workers from whole-body vibration.
- Have adjustable arm support when appropriate.

A standing position is generally required where:
- heavy, bulky loads are involved;
- forceful movements are involved;
- there are frequent moves from the workstation;
- no knee room is provided; and
- there is limited space.

The optimum height of the work surface is determined by the type of work, the visibility of the task, reach distances, and the force and speed of work movements. The elbow, with the arm by the side, is used as the point of reference for the following:

- A task which requires considerable force or uses the body for leverage (e.g. hammering or drilling at a workbench) should be done at hip height.
- A task which requires limited force and a range of arm movements using the shoulder (e.g. taking items from a stack and placing them on a conveyor) should be done at between elbow and hip height.
- A task which requires precision and minimal force (e.g. assembly work) should be done at just above elbow height. Where a sustained posture is required for precision work, the forearms should be suitably supported.
- A task which does not require the hands to make a wide range of movements and where the elbows may rest on the work surface (e.g. when writing) should be done at just above elbow height.
- A task which requires the use of a keyboard should be done at elbow height with arm movement unrestricted by such things as armrests and cluttered work surfaces.

Because of differences in stature, a single work surface height may not be suitable for all workers. Adjustable workstations, where workable, allow work surface heights to be quickly matched to a range of workers.

Storage

Storage areas should be organized so that workers maintain good body positions, reduce muscular forces and avoid excessive reach. Store heavy items between knee and shoulder height and frequently used items so that they are easily accessible and between waist and shoulder height.

Work Fixtures

Workers should not have to use their hands or bodies as a vise to hold objects; mechanical devices do this much better. Tooling fixtures and jigs should be set up to avoid awkward postures and excessive forces.

Materials Handling / Movement

Lifting, carrying, pushing or pulling objects can strain the back, arms and shoulders. Strength and lifting limits should not be exceeded; extreme muscular exertion can cause injury. The following steps will make materials handling/movement easier:

- Do not exceed the physical ability of the worker doing the lifting.
- Provide adequate recovery time for tasks that require frequent lifting.
- Provide easy access so the load is in front of the person lifting.
- Eliminate twisting by changing the start or end point of the lift.
- Put items to be lifted between knee and shoulder height.
- Provide handles or cutouts to make grasping easier, permit a closer lift, and allow items to be carried near the body.
- Change an object's shape to make it easier to grasp.
- Decrease the weight of objects.
- Decrease the distance or height over which the object must be moved.
- Distribute a load evenly within a container.
- Use hand carts or hand trucks.
- Use a vacuum-assisted hoist or integrated conveyors.
- Use loaders, cranes and motorized material pallets to help move loads that are larger or heavier than one or two people can safely handle.

Work Environment

Here are some ways you can minimize work-environment hazards:

- Isolate equipment or operations that produce loud or distracting noise.
- Make lighting bright enough without causing glare so workers can see clearly.
- Isolate hands and feet from cold.
- Reduce whole-body vibration while riding in a vehicle or standing near equipment.
- Isolate workers from excessive heat; provide adequate cooling and ventilation.

Mechanical Stress

Exposure to hard or sharp edges, such as a table edge, can damage nerves, tendons and blood vessels. Equipment should be moved so a worker doesn't touch the edge, or edges should be padded to minimize contact. For example, in packing boxes, the position of the box could be changed so a worker doesn't have to contact a sharp table edge while placing items into the box.

Repetitive Motion Tasks

Where workable, single task, repetitive jobs should be avoided or redesigned to eliminate repetition. Jobs should be designed so that they include a mixture of repetitive and non-repetitive work. For example, a word processor's job may be redesigned so that job content is varied to include a number of different tasks that are at the same level of responsibility. Job rearrangement or redesign encourages a number of varied activities and postures rather than sitting at one workstation. For example, the tray containing new work for the word processor may be placed on a table at a distance away from the keyboard workstation, necessitating the worker walk to get the work. The printer also may be located so that the worker has to get up to retrieve work. An important caution in job redesign is not to provide similar tasks consecutively.

Excessive Force

Workers must use excessive force when objects are difficult to grasp or control, equipment and tools are poorly maintained, or tasks require awkward postures. You can eliminate the use of excessive force by:

- Improving friction on slippery objects.
- Using mechanically assisted devices for awkward lifts.
- Choosing tools that better fit the hand.
- Keeping equipment properly maintained to prevent jamming and sticking.
- Providing adequate work room to perform tasks.

Tool and Equipment Design

Tools and equipment should fit the individual user and be chosen for the specific demands of the task. Tools should be designed to allow workers to maintain neutral body positions. Take extra care to avoid twisting, vibration, static muscle loading, and pressure on tissues and joints. Factors that can be modified to prevent risks include:

- **Tool size, weight and balance**
  You should select tools just heavy enough to accomplish the task. The following can be done to minimize risks:

  - Use counterweights or supports to minimize the weight of a tool; extra force should not be required to counteract the balancer.
  - Select tools that can bend or are shaped to prevent awkward wrist or shoulder postures.
  - Select balanced tools that can be held at their center of gravity.

- **Handle size and position**
  The size of the handle influences the amount of force that can be exerted without straining the muscles and tendons. A handle that is too large or too small requires more force to accomplish the same amount of work as a tool with a correctly-sized handle. Handles should:

- Fit the individual user's hand and be long enough so that they don't press into the palm or wrist.
- Have rounded (not sharp) edges, a positive stop or flanged end.
- Be made of material that is non-conductive, compressible, and doesn't feel slippery.
- Minimize vibration transferred to the hand.

- **Power control**
  Workers should be able to turn a tool off and on or keep it running without using extra force. Auto-start/stop tools are preferred. You can do these things to reduce hazards:

- Minimize rotational forces with variable torque settings.
- Avoid high-tension and one-finger triggers.

The overall aim in the design, selection and use of hand tools is to ensure the worker can use the hand tool in a safe and effective way.

Hand tools should be appropriate for the task, comfortable and well-balanced.
The tool handle should be easily grasped by both small and large-handed workers.
Repeated shocks to the hand and wrist as in the repetitive use of hammers for assembly; tugging at cloth, wires or threads; or using jerky movements or sustaining sudden twisting forces from hand-held power tools, should be avoided. Such shock loading, with repetition over a sustained period, may have a cumulative damaging effect.

Suspending power tools from balancers can relieve muscle fatigue in repetitive work. Well-designed balancers will counteract the effect of gravity. Attention should be paid to the appropriate adjustment of balancers.

Controls and Displays

The location of equipment/machinery controls and indicators should take into account their importance, frequency and sequence of use, and height of workers. Controls and displays need to be visible and accessible while in use, and easy to operate in relation to equipment functions. Spacing should be adequate to accommodate gloves or other protective equipment.

As a general guide, work activities or controls of most importance, of highest use and/or requiring rapid activation should be in front of the worker and within easy reach.

The appropriate design, selection, arrangement and labelling of displays and control instruments is essential for safe operation of equipment, and will assist in correct posture.

A sensible layout of both displays and control instruments will make monitoring easier, reduce the risk of confusion caused by misreading, and reduce visual and postural strain.

For work with screen-based equipment, the relative position of the screen, keyboard and document holder should be determined by the task. Large work spaces and adjustable equipment allow task requirements and individual preferences and needs to be accommodated.

Connectors, Fasteners and Valves

Components, connectors, valves and fasteners should be located to allow neutral postures during work. The following can help reduce risks:

- Quick-release connectors and fasteners that require few turns with little force can reduce strain.
- Connectors should be positioned to allow easy access.
- Connectors should be labeled and set up to make connection easy and prevent cross-connection.

SUMMARY OF WORK- RELATED MUSCULOSKELETAL DISORDER RISK FACTORS AND CONTROL OPTIONS

RISK FACTOR	DEFINITION	POSSIBLE RISK CONTROL OPTIONS
Awkward Postures	- those outside the 'neutral' range defined for each joint as optimal for applying force and minimising injury	- change height, reach or orientation of work or workstation/equipment/tools; use adjustable stands - avoid awkward postures (e.g. use angled hand tools to keep wrists straight) - use turntables or conveyors to bring items closer - ensure adequate vision - use tilted work surfaces and spring-loaded surfaces
High Repetitions	- tasks or series of motions that are performed over and over again by the same muscle groups with little variation	- combine or eliminate some parts of task - ensure worker has some flexibility over pace and breaks; take frequent micro-pauses; implement job rotation - train in good techniques
Forceful exertions	- forces are generated by muscles of the hands and arms to cause movement (e.g. turning a board, gripping an item)	- reduce weight of objects held, or use devices to hold them - reduce gripping or improve grip on tool - replace muscles with motors or mechanisation - use larger, stronger muscles (e.g. power grip vs. pinch) - ensure gloves are well-fitting and improve friction - reduce handtool vibration and minimise cold
Static Load	- muscular contraction maintained with no movement (e.g. gripping tool, bending/leaning over)	- use fixtures and clamps to hold materials; suspend tools - provide armrests where arms are elevated; provide appropriate working heights and reaches to keep arms close to body - job rotation, micro-pauses, rest breaks - provide chairs, sit-stand stools or footrests
Local Mechanical Stresses (Contact stresses)	- parts of the body in contact with objects (e.g. resting palm-side of wrist on sharp surface, leaning with thighs against edge of workbench)	- distribute pressure over as wide an area as possible - use tools with handles that extend beyond base of hand - pad surfaces where body in contact; round surfaces on handles - avoid thumb activation of buttons on hand tools – use all fingers - use clamps to hold materials/parts
Manual Materials Handling	- lifting of objects (including people)	- minimise material movement through good design - use mechanical assists (lift trucks, platforms, hoists) - reduce weight of object; assign more people to lift/carry - provide better grip with handles - reduce horizontal distance with good access - limit stacking heights; store heavy objects and materials used most frequently at waist height - change layout to reduce twisting; use good techniques

RISK FACTOR	DEFINITION	POSSIBLE RISK CONTROL OPTIONS
Pushing, Pulling and Carrying	- pushing, pulling or carrying of objects, carts, people etc.	- reduce force with good wheels and handles - minimise distances
Working Heights	- vertical work level → affects posture	- spring-bottom bins, lift tables, levelators, extend arms of tools, adjustable work surfaces, stools, ladders
Working Reaches	- distance to objects handled	- redesign to bring items closer; use tilting mechanism, electronic eyes, rollers, etc. - reorient product, remove obstructions
Hand-arm Vibration	- vibration of hand and arm due to power tools use	- keep hand tools that vibrate well-maintained to minimise unnecessary vibration - minimise reactive torques - minimise grip to reduce impact of vibration (e.g. wear proper gloves)
Grip Type	- hand grip on object/tool	- avoid pinch grips (thumb and tips of fingers) - use full-hand power grips - keep weights low where pinch grips are required
Shock (Impact Loading)	- high, sudden forces on body	- avoid using hand as a hammer - minimise torque and reactive forces on tools
Unaccustomed Activity	- activities worker does not perform often; modified duties	- phase new or injured workers into job gradually – start with fewer hours - allow worker control over pace - encourage rest breaks/micro-pauses
Extreme Temperatures	- extreme high or low temperatures due to environment, job processes	- keep body and hands warm by increasing temperature or adding extra clothing - use gloves (if don't interfere with gripping) or partial gloves (fingers exposed), protective clothing/equipment
Sitting	- prolonged periods in chair or sit-stand stool	- for multiple users, make adjustable - provide seating adjustment instructions and training - allow sufficient leg room and micropauses
Standing	- prolonged periods stationary in one place	- alternate with sitting, sit/stand and walking tasks - use anti-fatigue matting and a low footrail

Adopted from 'Investigating and Controlling Work-Related Musculoskeletal Disorders', Workers' Compensation Board of British Columbia

APPENDIX H

GENERAL ERGONOMIC INFORMATION

SELECT STUDIES OF THE EFFECTIVENESS OF VARIOUS CONTROL STRATEGIES FOR REDUCING MUSCULOSKELETAL INJURIES

STUDY	TYPE OF WORK TASK	NUMBERS OF WORKERS	METHOD OF INTERVENTION	SUMMARY OF RESULTS	ADDITIONAL COMMENTS
Jonsson (1988b)	Telephone assembly, manufacturing printed circuit cards, glass blowing, mining work	25 total workers studied	Job rotation	Job rotation in light duty tasks not as effective as in dynamic heavy duty tasks	Measured static load in trapezius muscle with EMG
Westgaard and Aaras (1984; 1985)	Production of cable forms	100 workers	Introduced adjustable workstations and fixtures, counterbalanced tools	Turnover decreased, musculoskeletal sick leave reduced by 2/3 over 8 year period; productivity increased	Positive effects of interventions verified by reductions in trapezius muscle EMG
Itani et al. (1979)	Photographic film rolling workers	124 total workers in two groups	Reduced work time, increased number of rest breaks	Reduction in cervicobrachial disorder and low back complaints; improved workers health	Post intervention productivity 86% of preintervention levels
Luopajarvi et al. (1982)	Food production packing tasks	200 workers	Redesigned packing machine	Decreases in neck, elbow and wrist pain	Not all recommended job changes implemented; workers still complain
McKenzie et al. (1985)	Telecommunications equipment manufacturer	6600 employees	Redesigned handles on powered screwdrivers and wire wrapping guns; instituted plant-wide ergonomics training program	Incidence rate of repetitive trauma disorders decreased from 2.2 to 0.53 cases/ 200 000 work hours and lost days reduced from 1001 to 129 in three years	Data inadequate for rigorous statistical evaluation

STUDY	TYPE OF WORK TASK	NUMBERS OF WORKERS	METHOD OF INTERVENTION	SUMMARY OF RESULTS	ADDITIONAL COMMENTS
Rigdon (Wall Street Journal 1992)	Bakery	630 employees	Formed union-management CTD committee; work station changes, tool modifications, improved work practices	CTS cases dropped from 34 to 13 in 4 years, lost days reduced from 731 to 8	Union advocated more equipment to reduce manual material handling
Lutz and Hansford (1987)	Manufacturer of sutures and wound closure products	>1000 employees	Introduced adjustable work stations and fixtures, mechanical aids to reduce repetitive motions, job rotation	Reduced medical visits form 76 to 28 per month	Results based on two departments with 33 employees; company enthusiastic about exercise program
Silverstein et al. (1987)	Investment casting plant	136 workers	Specific ergonomic changes not mentioned	No relationship between changes and prevalence of hand-wrist CTDs	Ergonomic changes did not reduce the risk of studied jobs
Jorgensen et al. (1987)	Airline baggage loaders	6 males	Introduced a telescopic bin loading system	Local muscular load on the shoulders and low back reduced	Measured EMG of the trapezius and erector spinae muscles
Geras et al. (unpublished)	Rubber and plastic parts workers	87 plants of a national company	Introduced an ergonomics training and intervention program; added material handling equipment, work station modifications to eliminate postural stresses	Lost time at two plants reduced from 4.9 and 9.7/200 000 hours to 0.9 and 2.6, respectively over 4 year period	Key to success has been increased training, awareness of hazards and improved communication between management and workers
LaBar (1992)	Household products manufacturer	800 workers	Introduced adjustable workstations, improved the grips on hand tools, improved organisation and work flow	Reduced injuries (particularly back by 50%)	Company also has a labour-management safety committee that investigates ergonomics-related complaints

STUDY	TYPE OF WORK TASK	NUMBERS OF WORKERS	METHOD OF INTERVENTION	SUMMARY OF RESULTS	ADDITIONAL COMMENTS
Orgel et l. (1992)	Grocery store	23 employees	Redesigned checkstand to reduce reach distances; installed a height-adjustable keyboard; trained workers to adopt preferred work practices	Lower rate of self-reported neck, upper back and shoulder discomfort; no change in arm, forearm, wrist discomfort	Study lacked a control group
Kilbom (1988)	Reviews intervention programs in various industries	14 studies		Concludes that job redesigns are most effective, but as the physical environment improves, work organisation and psychosocial factors become more important	
Echard et al. (1987)	Automobile manufacturer		Redesigned tools, fixtures and work organisation in assembly operations	Reduced long-term upper extremity and back disabilities; reduced CTS surgeries by 50%	
Snook et al. (1978)	Insurance company survey	200 surveys	Selection of workers; training in lifting technique; design of lifting tasks to fit worker capabilities	Selection and training not effective; matching job demands to workers capabilities can reduce injuries by 2/3	Authors also conclude that 1/3 of low back injuries will occur no matter what hazard control approach is used
Drury and Wick (1984)	Shoe manufacturer	6 work sites	Work station redesign	Reduced postural stress; increased productivity	Trunk and upper limbs most affected by changes

SELECT STUDIES DEMONSTRATING EFFECTIVENESS OF ENGINEERING CONTROLS FOR REDUCING EXPOSURE TO ERGONOMIC RISK FACTORS

STUDY	TARGET POPULATION	PROBLEM / RISK FACTOR	CONTROL MEASURE	EFFECT
Miller, Ransohoff and Tichauer (1971)	Surgeons (bayonet forceps)	Muscle fatigue during forceps use, frequent errors while passing instruments	Redesigned forceps (increased surface area)	Reduced muscle tension (determined by EMG, fewer passing errors)
Armstrong, Kreutzberg and Foulke (1982)	Poultry cutters (knives)	Excessive muscle force during poultry cutting tasks	Redesigned knife (reoriented blade, enlarged handle, provided strap for hand)	Reduced grip force during use, reduced forearm muscle fatigue
Knowlton and Gilbert (1983)	Carpenters (hammers)	Muscle fatigue, wrist deviation during hammering	Bent hammer handle, decreased handle diameter	Less strength decrement after use, reduced ulnar wrist deviation
Habes (1984)	Auto Workers	Back fatigue during embossing tasks	Provided cut out in die (reduced reach distance)	Reduced back muscle fatigue as determined by EMG
Goel and Rim (1987)	Miners (pneumatic chippers)	Hand-arm vibration	Provided padded gloves	Reduced vibration transmitted to the hand by 23.5% – 45.5%
Wick (1987)	Machine operators in a sandal plant	Pinch grips, wrist deviation, high repetition rates, static loading of legs and back	Provided adjustable chair and bench-mounted armrests, angled press, provided parts bins	Reduced wrist deviation, compressive force on L5/S1 disc from 85 lbs to 13 lbs
Little (1987)	Film notchers	Ulnar deviation, high repetition rates, pressure in the palm of the hand imposed by notching tool	Redesigned notching tool (extended, widened and bent handles, reduced squeezing force)	Reduced force from 12-15 lbs to 10 lbs, eliminated ulnar wrist deviation, increased productivity by 15%
Johnson (1988)	Power hand tool users	Muscle fatigue, excessive grip force	Added vinyl sleeve and brace to handle	Reduced grip force as determined by EMG
Fellows and Freivalds (1989)	Gardeners (rakes)	Blisters, muscle fatigue	Provided foam cover for handle	Reduced muscle tension and fatigue build-up as determined by EMG
Andersson (1990)	Power hand tool users	Hand-arm vibration	Provided vibration damping handle	Reduced hand-transmitted vibration by 61% - 85%

STUDY	TARGET POPULATION	PROBLEM / RISK FACTOR	CONTROL MEASURE	EFFECT
Radwin and Oh (1991)	Trigger-operated power hand tool users	Excessive hand exertion and muscle fatigue	Extended trigger	Reduced finger and palmar force during tool operation by 7%
Freudenthal et al. (1991)	Office workers	Static loading of back and shoulders during seated tasks	Provided desk with 10 degree incline, adjustable chair and table	Reduced moment of force at L5-S1 by 29%, at C7-T1 by 21%
Powers, Hedge and Martin (1992)	Office workers	Wrist deviation during typing tasks	Provided forearm supports and a negative slope keyboard support system	Reduced wrist extension
Erisman and Wick (1992)	Assembly workers	Pinch grips, wrist deviation	Provided new assembly fixture	Eliminated pinch grips, reduced wrist deviations by 65%, reduced cycle time by 50%
Luttmann and Jager (1992)	Weavers	Forearm muscle fatigue	Redesigned workstation (numerous changes)	Reduced fatigue build-up as indicated by EMG, improved quality of product

Requirements			
DEFINITION **MSI**	'MSI' means an injury or disorder of the muscles, tendons, ligaments, joints, nerves, blood vessels or related soft tissue including sprain, strain and inflammation that may be caused or aggravated by work (S. 4.46).	'MSI' means an injury or disorder of the muscles, tendons, ligaments, nerves, joints, bones or supporting vasculature that may be caused or aggravated by any of the following: 7 ergonomic stressors listed (S. 81(1)).	'RMI' refers to a repetitive motion injury, predominantly caused by a repetitive job, process or operation, and is categorized within the overall classification of musculoskeletal injury.
RISK IDENTIFICATION AND ASSESSMENT	The employer must identify factors in the workplace that may expose workers to a risk of MSI (S.4.47). When factors that may expose workers to a risk of MSI have been identified, the employer must ensure that the risk is assessed (S.4.48).	Where a risk of MSI is identified, an employer or contractor shall: (a) inform the worker of the risk and of the signs and symptoms; (b) provide affective protection for each worker who may be at risk (S.81(3)). Promptly review the activities of workers in similar tasks and take corrective measures (S.81(5)(b)).	Each job, process, or operation of identical work activity, or a representative number of such jobs, process, or operations of identical work activities shall be evaluated for exposures which have caused RMIs. (5110.b1)
RISK FACTORS	Physical demands of the work; Layout and Condition of the workplace; Characteristics of the objects handled; Environment; Organization of work (S.4.49).	(S.78) Lifting and handling loads; (S.79) Standing; (S.80) Sitting; (S.82) Shift work and constant exertion; (S.83) Visually demanding tasks	Predominantly caused by a repetitive job, process or operation (5110.a1).
RISK CONTROL	The employer must eliminate or, if not practicable, minimize the risk of MSI to workers; PPE is only a substitute for engineering or administrative controls; Interim control measures must be immediately implemented where permanent controls are delayed (S4.51).	Where risk of MSI is identified, the employer must provide effective protection which may include equipment, appropriate work practices and procedures, and schedules that incorporate rest, recovery periods, changes in workload or arrangements for alternating work to reduce harmful effects (S.81(3)).	Employers shall establish and implement a program designed to minimize RMIs that includes work site evaluation, control of exposures and training of employees. The employer shall consider engineering and administrative controls. Any exposures that caused RMIS shall be corrected or minimized to the extent feasible (5110.b2).
EVALUATION	The employer must monitor the effectiveness of the measures taken to comply with the Ergonomics (MSI) Requirements and ensure they are reviewed at least annually. When deficiencies are detected they must be corrected without delay (S.4.52). Employer must consult with the O.H.S. Committee (S.4.53).	An employer or contractor, in consultation with the JHS committee, shall regularly review the activities at the place of employment that may cause or aggravate MSI (S.81(2)).	Each job, process, or operation of identical work activity, or a representative number of jobs, processes, or operations of identical work activities shall be evaluated for exposures that have caused RMIs (5110.b1)
EDUCATION AND TRAINING	The employer must ensure that a worker who is exposed to a risk of MSI is educated in risk identification related to the work, including signs and symptoms of MSIs. Employer must ensure that worker assigned to job requiring specific measures is trained in those measures (S.4.51).	Employer or contractor shall ensure that workers who may be at risk of developing MSIs are instructed in the safe performance of the work, including the use of appropriate practices and procedures, equipment and PPE (S.81(4)).	Employees shall be provided training that includes an explanation of: the employers program; exposures associated with RMIs; symptoms and consequences of injuries; importance of reporting symptoms; methods used by the employer to minimize RMIS (5110.b3B).

Requirement	[illegible]	[illegible]	[illegible]
DEFINITION **MSI**	MSDs are strains, sprains, tears, back pain, soreness, hurt back (including carpal tunnel syndrome and hernia) affecting muscles, nerves, tendons, ligaments, joints, cartilage, and spinal discs that are caused by overexertion, repetition, bodily reactions such as bending and crawling, but not due to slips, trips, falls (1910.513).	OOS (Occupational Overuse Syndrome) refers to conditions characterised by discomfort or persistent pain in muscles, tendons and other soft tissues, with or without physical manifestations; associated with tasks which involve: repetitive and/or forceful movement; maintenance of constrained or awkward postures.	OOS is a collective term for a range of conditions, including injury, characterised by discomfort or persistent pain in muscles, tendons and other soft tissues (not to be confused with pain due to unaccustomed exercise/activity or pain of arthritis).
RISK IDENTIFICATION AND ASSESSMENT	Must identify MSDs and MSD hazards and make employees aware of them using any form of communication that the employees can understand, make medical management available promptly and analyze the job and implement requisite ergonomics program (1910.505 & 506).	Identify manual handling tasks which may be risk to health and safety through analysis of workplace injury and incident records, consultation with employees, observation; conduct assessments of risk factors; consider and implement control measures to eliminate or reduce risks.	Various aspects of work should be assessed, including: task specification; nature of task; task organisation; amount/rate of work; and organisational practices of work. All factors should be considered.
RISK FACTORS	Physical demands of the work tasks, job; Workstation layout and space; Equipment used and objects handled; Environmental conditions; Work organization (1910.513).	Awkward body postures; poorly designed workstations, equipment, tasks; vibration; impact forces; work organisation; and repetition (HOHSC:2013(5.3)).	Repetitive movements; Sustained or constrained postures; Forceful movements; Stress; Absence of variety and rest breaks
RISK CONTROL	Administrative controls are interim measures where feasible engineering controls are available. Where MSDs cannot be eliminated the employer must be able to take quick and effective action when MSDs occur and medical management must be available. A plan must be developed to subsequently control MSDs (1910.506).	Use risk control hierarchy to select approach: • Redesign to eliminate risk • Redesign to reduce risk • Use of mechanical devices • Task-specific training • Combine risk control priorities; Adopt measures from top of hierarchy wherever workable. Measures from bottom regarded as interim until control options can be implemented (2013(8.4)).	Five main areas in which prevention of OOS is possible; • design of equipment and tasks • organisation of work • work environment • training and education • development of polic[illegible]
EVALUATION	Ergonomics program must be evaluated periodically to ensure effectiveness in eliminating or minimizing hazards through the following procedure: • selecting measures to evaluate the program; • monitoring program activities; and • evaluating the program and controls to determine effectiveness (1910.509).	The implementation of the risk control approach does not end with implementation of change. The effectiveness of the new control measures needs to be reviewed regularly by the employer, employee, employee representatives to ensure that the objectives are being achieved and that there are no unforeseen negative outcomes (2013(5.21).	Internal reporting system should be established with clear guidelines to supervisors on action to be taken. Reporting system must ensure that early remedial action is taken.
EDUCATION AND TRAINING	Employer must provide training, at no cost to worker, to: • employees in jobs where there are MSDs; • their supervisors; and • managers, supervisors and employees who are involved in setting up and managing the ergonomics program (1910.507).	Where risks assessed, employers must ensure employees receive appropriate training in safe work practices. In addition to general training, task-specific training should be provided to enable employee to perform task in safe/healthy manner (2013 (5.6 & 5.7).	Training/education essential to success of programme. Aims: increase understanding of OOS; decrease incidence of OOS through safe working techniques, hazard awareness, early reporting procedures. Train managers, supervisors, workers, H&S and union reps.